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Knapweeds, Starthistles, and Basketflowers

KNAPWEEDS, STARTHISTLES, AND BASKETFLOWERS OF NEW MEXICO

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Introduction

Knapweeds, starthistles, and basketflowers are primarily weedy and often noxious invaders of range lands, roadsides, old fields, and disturbed sites. Knapweeds and starthistles are all alien plant species in New Mexico, coming originally from the Mediterranean and Eurasian regions of the Old World. Many of these species are now found throughout much of the world, though, having adaptations that aid in dispersal, rapid germination and growth, and avoidance of predation. They are detrimental invaders of range lands, being low in palatability as forage and poor protectors of the soil against erosion. Basketflowers, however, are indigenous to North America, and often occur in less disturbed or less weedy habitats.

Belonging to the tribe Cynareae of the family Asteraceae, the species of this group are characterized by an absence of ray flowers, the disk flowers at the periphery of the head being enlarged to simulate rays, and an oblique attachment of the achene on the receptacle (except for one species). Phyllaries are spiny, fringed, or chaffy, and are sometimes long and stout, capable of inflicting a pernicious wound. Each disk flower in the head produces an achene. The pappus may be absent or present as a crown of stiff bristles at one end.

There are about 450 species of knapweeds, starthistles, and basketflowers in the world, mostly in the Old World. The taxonomy of this group is complex and difficult, and the species are sometimes classified in several different genera. We follow a more traditional approach here, placing all of the New Mexico species but one in the genus Centaurea, with Russian knapweed assigned to the genus Acroptilon. The name Centaurea commemorates the centaur, the mythical creature of Hippocrates, half horse and half man. The name Acroptilon (meaning feathery tip) refers to the plume-like bristles at the tip of the phyllaries.

Indentification Key to the Species

1 Flower heads strongly and conspicuously spiny, the spines 5-25 mm long ... go to 2
1 Flower heads lacking spines, or if slightly spiny, the spines less than 5 mm long ... go to 4

2 Stems not winged; flowers purplish; achenes without a pappus ... 1. PURPLE STARTHISTLE
2 Stems winged; flowers yellow; at least the achenes in the center of the head with a pappus ... go to 3

3 Terminal spine of the phyllaries 5-10 mm long; both marginal and central florets with a pappus 1.5-3 mm long ... 2. MALTA STARTHISTLE
3 Terminal spine of the phyllaries 10-25 mm long; marginal florets lacking a pappus, the central florets with a pappus 3-5 mm long ... 3. YELLOW STARTHISTLE

4 Plants rhizomatous; phyllaries entire with translucent margins, not toothed nor fringed ... 4. RUSSIAN KNAPWEED
4 Plants lacking rhizomes; phyllaries toothed, fringed. or slightly spiny ... go to 5

5 Leaves, at least the lower ones, dissected ... go to 6
5 Leaves entire or only toothed ... go to 7

6 Phyllaries both fringed and with a short terminal spine or lobe 1-4 mm long; pappus absent ... 5. DIFFUSE KNAPWEED
6 Phyllaries fringed but without a terminal spine or lobe; pappus 2-3 mm long ... 6. SPOTTED KNAPWEED

7 Flower heads 1-2 cm wide ... 7. CORNFLOWER
7 Flower heads 2-5 cm wide ... go to 8

8 Phyllaries medium to dark brown, bearing 9-15 pairs of lobes at the tips ... 8. ROTHROCK'S BASKETFLOWER
8 Phyllaries straw colored, bearing 4-8 pairs of lobes at the tips ... 9. AMERICAN BASKETFLOWER

1. PURPLE STARTHISTLE

(Caltrop, maize thorn)

Centaurea calcitrapa Linnaeus

Description: Plants bushy, normally biennial, but sometimes also annual or short-lived perennial, from a taproot. Stems rigid, highly branched, with longitudinal white lines but not winged from the leaf bases, cobwebby-hairy to glabrous, 20-80 cm tall. Basal and stem leaves divided once or twice into spiny-toothed segments, generally 2-4 cm long but smaller near the flower heads. Flower heads urn-shaped, 1-2.3 cm tall. Phyllaries straw-colored, ending in a stout spine grooved or flattened on the upper surface and 1-3 cm long, with 2-3 pairs of lateral spines at the base. Flowers purple, the peripheral flowers not enlarged. Achenes tan to light brown with darker shading, 2.5-3 mm long, lacking a pappus.

Habitat and Distribution: Indigenous to the Mediterranean region and introduced to North America in California as a seed contaminant; adventive in New Mexico along roadsides and in disturbed ground of farms and cropland [Chaves, Otero counties].

Comments: Purple starthistle is very similar to Iberian starthistle (Centaurea iberica Trev.), not yet found in New Mexico, and which differs in having achenes topped by a pappus. This species is also sometimes confused with malta starthistle, which has a much less bushy growth form. The young heads of purple starthistle are reportedly edible like an artichoke. The specific epithet, calcitrapa (Latin, "heel-traps"), alludes to its resemblance to caltrops, iron balls with four spikes that were used during warfare to empede cavalry or armored vehicles.

2. MALTA STARTHISTLE

(Tocalote, Napa starthistle)

Centaurea melitensis Linnaeus

Description: Plants annual or biennial from an unbranched taproot. Stems erect, branched, rough-hairy, winged by the decurrent leaf bases, 30-100 cm tall. Basal leaves lobed, spatula-shaped in outline, with a short stalk, rough-scabrous, 3-5 cm long. Stem leaves narrowly lanceolate, entire or sparsely toothed, sessile, 1-4 cm long, the base of the leaf running down the stem as wings (decurrent). Flower heads ovoid, solitary or 2-3 clustered at the tips of the branches, 1.5-2 cm tall. Phyllaries straw-colored but tinged with purple or brown, with sparse wooly hairs, ending in a stiff, flattened spine 5-10 mm long, with 2-4 short lateral spines at the base and a pair of shorter lateral spines about mid-length. Flowers yellow, the peripheral ones not enlarged. Achenes light brown with longitudinal lines, about 3 mm long, with a pappus of unequal bristles 1.5-3 mm long, the base with a slight hook.

Habitat and Distribution: Indigenous to southern Europe and introduced in North America; now found in scattered localities in the western states; adventive in southern New Mexico along roadsides, abandoned crop fields, and along ditches [Chaves, Doña Ana, Eddy, Grant, Hidalgo, Luna, Otero counties].

Comments: Both malta and yellow starthistles have winged stems and yellow flowers, but malta starthistle differs in having shorter phyllary spines with a tiny pair of lateral spines about midlength. Purple starthistle is much more bushy in its growth form. The specific epithet, melitensis, refers to its occurrence on Malta.

3. YELLOW STARTHISTLE

(St. Barnaby's thistle)

Centaurea solstitialis Linnaeus

[Leucantha solstitialis (L.) Löve & Löve, Calcitrapa solstitialis (L.) Lam.]

Description: Plants annual or biennial from stout taproots, usually flowering the first year. Stems stiffly upright, freely branched, winged by decurrent leaf bases, with sparse cottony hairs, 20-100 cm tall. Basal leaves spatula-shaped in outline, deeply lobed, early deciduous, similar to dandelion rosettes. Stem leaves linear to lanceolate, entire, sessile, cottony-hairy and grayish, the base of the leaf running down the stem as wings (decurrent). Flower heads solitary at the tips of the branches, ovoid, 1.5-2 cm tall. Phyllaries straw-colored, ending in a stiff round spine 1-3 cm long, with 2-4 short lateral spines at

the base. Flowers yellow, the peripheral ones not enlarged. Achenes dark brown to tan, 2.5-4 mm long, of two types; inner achenes with a pappus of stiff bristles 2-5 mm long; peripheral achenes lack a pappus.

Habitat and Distribution: Native to Eurasia and introduced to the United States in California sometime between 1824 and 1869, presumably with alfalfa seed; adventive in New Mexico along roadsides and disturbed ground [Chaves, Grant, San Miguel counties].

Comments: Yellow starthistle may cause "chewing disease" in horses (see discussion under russian knapweed). The inner, plumed achenes of yellow starthistle drop from the flower heads when mature, are blown for short distances by the wind, and germinate readily with the first favorable conditions. The peripheral, plumeless seeds are not released, however, and remain within the flower head until the phyllaries deteriorate during the fall or winter; these seeds germinate under higher temperatures and produce seedlings with longer roots. It is suspected that some seeds of yellow starthistle can remain viable in the soil for up to 12 years. Various song birds feed heavily on the seeds and contribute to the spread of yellow starthistle across the western United States. The specific epithet, solstitialis alludes to the summer flowering period.

4. RUSSIAN KNAPWEED

(Turkestan thistle, creeping knapweed)

Acroptilon repens (L.) DeCandolle

[Centaurea repens L., Centaurea picris Pall.]

Description: Plants perennial, forming dense colonies from shoots arising from the widely spreading black roots. Stems erect, openly branched, 20-100 cm tall, with loose cobwebby hairs when young. Basal leaves spatula-shaped, entire to toothed, thinly hairy, bluish green, 3-8 cm long, 1-2 cm wide. Stem leaves shallowly lobed or toothed, 1-5 cm long, 2-7 mm wide, becoming smaller and entire near the flower heads. Flower heads numerous, terminating the branches, 1-2 cm tall. Phyllaries greenish to straw-colored, not spiny, the lower (outer) phyllaries with a broad translucent tip, the upper (inner) phyllaries with a narrowed plume-like tip. Flowers pink or purplish, the peripheral ones not enlarged. Achenes ivory-white, 3-3.5 mm long, attached horizontally at the base rather than at an angle as in the other knapweeds, with long (6-11 mm) white bristles at the tip (pappus) when young, but these deciduous from the achene as it matures.

Habitat and Distribution: Native to Eurasia, russian knapweed was introduced to North America in 1898 with alfalfa seed; it now occurs in every western state and in many of the eastern ones; adventive in New Mexico mostly along roadsides, but also in pastures, crop fields, and orchards; our most common knapweed [Bernalillo, Catron, Cibola, Lincoln, McKinley, Otero, Quay, Rio Arriba, Sandoval, San Juan, Santa Fe, Socorro, Taos counties].

Comments: Russian knapweed and yellow starthistle are toxic to horses, producing a neurological disorder known as "chewing disease." The disease is characterized by an acute inability of the animal to eat or drink, and resembles Parkinson's disease in humans. Chewing disease occurs suddenly after prolonged ingestion of the plants over many days. Russian knapweed is usually not palatable to horses because of its bitter quinone-like taste, but some animals may acquire a preference for yellow starthistle

and eat it even though other good forage is available. Infestations of russian knapweed may survive almost indefinitely because of it's ability to produce aerial shoots from the spreading root system. A stand in Saskatchewan, Canada, has persisted for almost 100 years. The specific epithet, repens, refers to the creeping growth of the rootstocks.

5. DIFFUSE KNAPWEED

(spreading knapweed, tumble knapweed)

Centaurea diffusa Lamarck

[Acosta diffusa (Lam.) Sojak]

Description: Plants generally biennial, but sometimes annual or perennial. Stems upright, 10-60 cm tall from a deep taproot, highly branched, angled with short stiff hairs on the ridges, eventually breaking off and rolling in the wind to disperse the achenes. Basal leaves stalked and divided into narrow hairy segments, 3-8 cm long, 1-3 cm wide, deciduous. Stem leaves smaller and less divided, sessile, becoming bract-like near the flower clusters. Flower heads broadly urn-shaped, solitary or in clusters of 2-3 at the ends of the branches, 1.5-2 cm tall. Phyllaries yellowish with a brownish margin, sometimes spotted, fringed on the sides and terminating in a slender bristle or spine 1-5 mm long. Flowers white, rose-purple, to lavender, the peripheral ones not enlarged. Achenes tan to brown, about 2.5 mm long, lacking a pappus, or bristles rarely present to about 1 mm long.

Habitat and Distribution: Endigenous to the Mediterranean region but now found scattered throughout much of the northern United States, less common elsewhere; adventive in New Mexico along roadsides [Colfax, San Miguel counties].

Comments: Diffuse knapweed is a highly competitive and aggressive plant that threatens to over-run pastures and range lands in the western United States. It is especially adept at moving along right-of-ways and farm roads and can spread rapidly through an area. Its spread into vegetated areas is retarded (though not prevented) by associated grasses that remove moisture and nutrients from the rooting zone of diffuse knapweed seedlings. There is some evidence that diffuse knapweed chemicals have the potential to inhibit the germination of other seeds, thereby giving it a competitive advantage in the soil. This species may hybridize with spotted knapweed, making identification of some specimens difficult. Occasionally, diffuse and other knapweeds are sold in floral bouquets. The specific epithet, diffusa, describes the open branching pattern of mature plants.

6. SPOTTED KNAPWEED

Centaurea biebersteinii DeCandolle

[Centaurea maculosa and Acosta maculosa of various works]

Description: Plants perennial, sometimes short-lived, from a stout taproot. Stems erect, 1-several from the base, branched above, ridged, loosely cobwebby, 30-80 cm tall. Basal leaves spatula-shaped in outline, usually deeply divided, 5-15 cm long. Stem leaves divided into narrow segments 1-3 mm wide,

glabrous or usually wooly-hairy, becoming bract-like near the flower heads. Flower heads broadly urn-shaped, solitary at the ends of the branches, 1-2 cm tall, sparsely hairy or glabrous. Phyllaries with vertical veins below the black-spotted tip (often colorless in white-flowered forms), the tips fringed with comb-like lobes, the terminal lobe shorter than the others, not spiny. Flowers pink to purple, sometimes white, the peripheral ones enlarged and sterile. Achenes dark, with lines, 2.5-3.5 mm long, usually with a pappus of stiff bristles 2-3 mm long.

Habitat and Distribution: Native to Europe and coming to North America as a contaminant in alfalfa and clover seeds, now widespread throughout much of the United States; adventive in New Mexico along roadsides [Colfax County].

Comments: Spotted knapweed is a serious pest of range lands, pastures, and open fields in many areas in the northern United States. It spreads rapidly along roads and into disturbed areas, the achenes and flower heads being carried by the wind, foraging animals, or trucks driving through knapweed patches. Studies indicate that spotted knapweed is capable of invading not only disturbed sites, but also ungrazed, good condition range land. In addition, seeds of spotted knapweed remain viable in the soil for at least eight years, and probably longer.

7. CORNFLOWER

(Bachelor's-button, blue-bottle, hurtsickle)

Centaurea cyanus Linnaeus

[Leucacantha cyanus (Lam.) Nieuwland & Lunell]

Description: Plants annual or winter annual from taproots. Stems upright, 2-10 cm tall, loosely wooly-hairy when young but losing this as they mature. Basal leaves lanceolate, lobed or toothed. Stem leaves narrow, linear to lanceolate, not divided or toothed, white-wooly on the lower surface, 4-15 cm long, 2-5 mm wide. Flower heads urn- or bowl-shaped, solitary at the ends of the branches, 1-2 cm tall. Phyllaries ovoid to lanceolate, with fine vertical lines, the edges papery and fringed, lacking spines. Flowers blue, purple, pink, or white, the peripheral ones funnel-shaped and enlarged but sterile. Achenes yellowish-brown to blackish, 3.5-4 mm long, tipped by orange-brown pappus of bristles 2-4 mm long.

Habitat and Distribution: Introduced from the Mediterranean region as a flower-garden ornamental; adventive in New Mexico along roadsides, fields, disturbed ground, and waste places; known definitely as an escape only in southern New Mexico, but expected elsewhere [Doña Ana County].

Comments: A favorite garden flower, cornflower is an easily cultivated annual that has many varieties and colors. Because of it ornamental value, it has spread throughout the world. The flowers retain their color upon drying and are often used in arrangements of dried flowers or in wreaths. The common name of hurtsickle comes from Europe, where the tough stems of plants infesting wheat field blunted the sickles of farmers. The specific epithet, cyanus, refers to the striking blue color of its flowers.

8. ROTHROCK'S BASKETFLOWER

Centaurea rothrockii Greenman

Description: Plants annual (or biennial?), from a taproot. Stems erect, ridged, glabrous, sparingly branched above, 30-100 cm tall. Basal and stem leaves lance- to spatula-shaped, entire to slightly toothed, glabrous to somewhat sandpapery, 3-12 cm long. Flower heads solitary at the ends of the stems, broadly bowl-shaped, 3-5 cm tall, 2-5 cm wide. Phyllaries composed of two parts: lower part entire, tan to light green with vertical lines; upper part medium brown to dark brown, the edges fringed with 9-15 pairs of elongate papery lobes. Flowers usually either all purple or all yellow, sometimes a mixture, the peripheral ones much enlarged. Achenes brown to black, 4-5 mm long, tipped by a pappus of bristles 6-14 mm long.

Habitat and Distribution: Endigenous to North America, from southwestern United States to south-central Mexico; in New Mexico in mountain meadows, wooded canyons, and along streams and roadsides [Grant, Sierra, Socorro counties].

Comments: Rothrock's basketflower is relatively little known in New Mexico, hiding in wooded canyons in the southwestern mountains. It is not at all weedy, and prefers natural, undisturbed habitats, in contrast with American basketflower, which is often found in old fields and along roads. It takes its name from Joseph Trimble Rothrock, surgeon and botanist for the Wheeler Expedition to southwestern United States in 1873-1875.

9. AMERICAN BASKETFLOWER

(American knapweed, thornless thistle)

Centaurea americana Nuttall

Description: Plants annual, from a taproot. Stems simple or branched in the upper portion, ridged, glabrous, 30-180 cm tall. Basal and stem leaves narrowly spatula-shaped to lanceolate, sand-papery, entire or sparsely toothed, 3-8 cm long, 5-15 mm wide. Flower heads solitary at the ends of the main stem or branches, broadly bowl-shaped, 3-5 cm tall, 2-6 cm wide. Phyllaries composed of two parts: lower part entire, straw-colored to light green with vertical lines; upper part light to dark straw-colored, the edges fringed with 4-8 pairs of elongate papery lobes. Flowers usually of two kinds: the central ones yellow or white; the peripheral ones purple or pink and much enlarged. Achenes dark-colored, 4-5 mm long, tipped by a pappus of bristles 6-14 mm long.

Habitat and Distribution: Endigenous to North America from central United States to east-central Mexico; in New Mexico in prairies, plains, open fields, and roadsides, often in disturbed ground [Chaves, Doña Ana, Eddy, Grant, Lincoln, Luna, Otero, Quay, San Miguel, Socorro, Torrance counties].

Comments: American basketflower typically occupies weedy, disturbed habitats, but it is not a noxious invader, such as the knapweeds and starthistles. Its showy flower heads make beautiful dried flower arrangements.

ADDITIONAL READING

Roché, B.F, Jr. Knapweed Newsletter. Washington Interagency Knapweed Committee, Cooperative Extension, Washington State University. Roché, C.T. & B.F. Roché, Jr. 1993. Identification of Knapweeds and Starthistles in the Pacific Northwest. Pacific Northwest Extension Publ. 432. &

In Memoriam: Barton H. Warnock, 1911-1998

Barton H. Warnock, 1911-1998

by Billie Turner, University of Texas at Austin

Reprinted from Plant science Bulletin 44(1):78-80. 1998.

His body was found slumped over the steering wheel of his car, face peering pensively out of the windshield across a section or two of Creosote bushes. He died of a heart attack about 20 miles northeast of Alpine, Texas along the highway to Fort Stockton (the place of his birth), the motor of his four wheel drive Bronco still running (how appropriate!).

The Department of Public Safety in Alpine was alerted by some anonymous truck driver on the morning of June 16 that he had observed a car beyond the road shoulder that had apparently been driven through a barbed wire fence, coming to rest about 100 yards off the tarmac: "maybe you should check it out." And they did, not knowing that the newly purchased vehicle was purring away the passing of a legendary Botanist.

As soon as the state troopers peered into the window of the car they were startled, one of them remarking, "By damn, why it's the doc," very casual like Southwesterners are prone to be facing death.

Nearly everyone in Texas west of the Pecos River knew Barton as the doc. To them he was a legend. And that's what the byline on the front page of the Alpine Avalanche read, BOTANICAL LEGEND IN WEST TEXAS DIES AT 86. And The Big Bend Quarterly (vol. II, No. 4) headed their eulogy of the man with this masthead, "LIKE TAKING A WALK WITH THE CREATOR." Clearly the man was a revered figure, to them at least, those who still trod the open range in scuffed boots and rusty spurs, driving pickups and cursing the blue skies "cause it ain't gonna rain today, maybe never," looking at their new growth of gramma grasses (they were botanists too!) with hope and fear (not showing either in their faces, true Texans). Barton belonged to the ranchers. He was their systematist. From El Paso to the Pecos, Barton knew them all, who owned what spread, how many sections, what kind of plants dominated, and why; he even knew the history of their places better than they did, having outlived most of the original owners.

Interestingly, Barton spent much of his time after retiring from his Professorship at Sul Ross State University, Alpine, as a plant collector and "curator" of ranch herbaria. He set up numerous small collections in one or two herbarium cases at the ranch headquarters of the bigger spreads in the trans-Pecos so that the ranch owner, or his manager, or the owners children (now too remote from ranching to be concerned) might know what their land grew and where.

Dr. Warnock was always an enigma to me, mainly because he seemed such a simple cuss to sport a Ph.D. I was an acquaintance of his for fully fifty years and in our many one-on-one conversations, never managed to probe successfully into any of his views on things psychological. Sometimes he would dumbfound me, however, with a remark from out of nowhere, "Turner, do you believe that there are really homosexuals in this world?" And after some briefly expressed incredulousity on my part as to the question itself, he would let the topic drop, as if the question was merely the flicker of a moment. I

mention this because, to me, he was one of the most intellectually naive professors to pass his shadow over my shoulder. Indeed, the mention of some of the more banal intellectual questions in our discussions, such as "the meaning of life? why we do what we do?" etc., would nearly always result in his retreat into some avuncular world unfamiliar to me: quoting homilies, or inventing these on the spot. Such conversations lived short lives.

But he did channel the course of my professional life. As a prelaw student at Sul Ross State College in 1947, age 22 and fresh out of the military, feeling my future, thinking I'd be a great lawyer, fighting the cases that counted, putting my learning on the line for the "...scorned, the rejected, the men hemmed in by the spears..." I was ever an idealist! So constituted in frame and bent, I enrolled in a freshman biology course at Sul Ross. Barton was the teacher.

Meeting Dr. Warnock (aged 36 at the time, fresh out of graduate school at The University of Texas, Austin, with a Ph.D. in plant ecology, his doctoral thesis entitled "A vegetational study of the Glass Mountains" [a sliver of elevated limestone about 30 miles east of Alpine, aligned in a north-south direction, beginning near Marathon and extending northwards into Pecos Co., where it soon peters out into flat lands dominated by Creosote and Black Brush]), changed my career, if not my life. How? He wooed me with words, smiles, and competition; noting that I excelled in his class with little effort and much enthusiasm, he began to ask me out on his collecting forays. Weird fellow, I thought, collecting plants in sets of four? I asked. "For exchange," he replied. "What's that?" I replied, "I mean 'for exchange' ?" And so it would go mile after mile, picking up the beginnings of botany, the names of plants, where the grew, what they were related to, those kinds of beginnings...

And he talked about other aspects of life too, the trivial aspects, often foolishly stated, like "Your wife nearly always knows what's best," uttered with a sincere little laugh, and a mischievous look, as if joshing. But he wasn't; for him this was seemingly true; for me it was idle chatter.

Anyway, I loved those field trips, beautiful landscapes, botanical unknowns, populations of this or that species strewn along highways and mountain crests, some of them even undescribed, Barton would venture, often adamantly so. "Now I know this plant is new, but every time I send it off to Dr. Tharp [his doctoral mentor at The University of Texas] it always comes back as so-and-so, but I know damn well it's not."

Lots of botany, laughter, teasing, and competition. I still remember one of his challenges: faced with an ascent of about 2000 feet up to the top of Altuda Peak, an isolated protrusion about 15 miles east of Alpine overgrown with oaks and miscellaneous shrubbery, Barton hollered out suddenly, "Beat you to the top Turner, you find your own way." And he took off in a trot up a broad gully at the base of the peak. I snickered, thinking, "Like hell, you will," and took off up my own little gully, knowing that my young legs would get there first. But they didn't. When I got to the top, there was the doc, smiling like a pig eating swill, remarking casually, "What took you so long, Turner? Been waiting here ten minutes or so." That kind of manner and mien in the man appealed to me: fully contagious, like teachers ought to be.

That kind of contagion and teaching careened many a Sul Ross student into graduate schools in botany departments across the country. To name but a few (those introduced to botany via Barton's tutelage), other than myself: A. Michael Powell, currently Professor at Sul Ross, having replaced Dr. Warnock upon the latter's retirement; John Averett, currently Professor of Biology and Chairman at Georgia Southern University; John Bacon, Professor of Biology at the University of Texas, Arlington; Tom Watson, independent researcher, now retired; not to mention the numerous Masters Degree students who became high school science teachers, wildlife researchers and yet other dedicated biological workers of this or that ilk.

While Dr. Warnock never published his doctoral thesis, noted in the above (a fine study for its day, the various plant communities beautifully documented with full page photographs, etc.), he did publish, a number of taxonomic papers, mostly having to do with new species from the trans-Pecos, often with co-authors, such as Dr. M. C. Johnston, who briefly occupied a faculty position at Sul Ross during his long and productive academic career. But such papers did not create his legendary status; rather, the latter was largely due to the publication of several books on the wildflowers of trans-Pecos, Texas. These include:

1970. Wildflowers of the Big Bend country, Texas. Sul Ross State Univ. 155 pp. 1974. Wildflowers of the Guadalupe Mountains and the Sand Dune Country, Texas. Sul Ross State Univ. 176 pp. 1977. Wildflowers of the Davis Mountains and the Marathon Basin, Texas. Sul Ross State Univ. 274 pp.

At the time of his death he had put together a fourth volume on the wildflowers of the trans-Pecos region, and this should be published in due course by some press other than Sul Ross. At least I was informed by Barton that such a text was ready to go to press.

All of the above wildflower books, except for the soon to be published text, were published in collaboration with Peter Koch, now deceased, who provided a large array of colored photographs for the books (several hundred or more to a text, six to a page, of varying quality, including everything from bryophytes to sunflowers).

Probably, Dr. Warnock would not have ventured into the wildflower publication business except for a bit of personal vanity and competitiveness (the "I'll show them" syndrome). Barton, in the late 1960s, began to think of himself as the botanical guru of the trans-Pecos, which he was, in a sense, as noted in the above. At least, I think he thought that most taxonomists in the United States knew of his work in that area, might even be aware that he had personally collected over 26,000 numbers from this region and that they would surely back his proposal, submitted to the National Science Foundation, to produce a Flora of the trans-Pecos. Barton even gave a paper before the American Society of Plant Taxonomists in which he outlined his ambitious plans, beguiling the professional audience with 24 carat smiles, and charming them with cowboy quips and humbling homilies. I was in that audience and felt he did a wonderful job of salesmanship. He thought the same. But it wasn't to be. His trans-Pecos flora project was rejected by his peers, nearly all of whom had been in the audience. Why? Not because they thought he couldn't do it, but simply because they were all aware, as was Dr. Warnock, that there was to appear shortly A Manual of the Vascular Plants of Texas by Correll and Johnston, this having been underwritten by the National Science Foundation over a ten year period or more.

Dr. Warnock never recovered from this rejection by his peers. He became bitter towards the taxonomic community, irrationally so, refusing to loan specimens of his holdings to yet other institutions and, upon occasion, even refusing professional visitors the courtesy of examining the SRSC herbarium sheets, in situ. I tried to explain to him that the tax payers might see little point in supporting the production of two floras of the same region, albeit overlapping. Alas, to no avail; he saw all of this as a personal vendetta. To my knowledge he never forgave the taxonomic establishment; thereafter he strode his own path, never again collecting plants in sets of four for exchange purposes; indeed he became disdainful of academic institutions in general, especially the bigger ones that thought they could call the plays, lay down the rules, pass judgment on the little fellows, something like that I think, drove him into his alienation from the larger systematic community.

But as Shakespeare put it, "Sweet are the uses of adversity, which, like the toad, ugly and venomous wears yet a precious jewel in its crown." Had not the doc suffered the ignominy of rejection he would surely have squandered years working on a mundane flora of the trans-Pecos that would have raised but few eyebrows. As it turned out, his competitive zeal and desire to show the academic elites that he didn't

need their support, made possible his trans-Pecos, if not statewide, sainthood.

Dr. Warnock really has had appreciation aplenty. Numerous taxa from the trans-Pecos and elsewhere have been named in his honor, including an endemic Texas genus, Warnockia (Lamiaceae). In addition, a building on the Sul Ross campus bears his name, as does a state park facility along the Rio Grande in Presidio County, Texas; few botanists can claim such edificial honors.

It is ironic, that had the legendary botanist, Art Cronquist, died of a heart attack driving in the environs of New York City (where he resided), car motor still purring away, it is likely that the first official persons on the scene might peer through the window and comment, "Boy, that's some big Swede," as if he had little legendary status on Long Island, an area infinitely smaller than the trans-Pecos region where the doc received instant recognition from the first persons on the scene. So who is the bigger legend? In the international community, of course, it was Cronquist; but in the confines of the trans-Pecos, it was Warnock.

I would like to add that Cronquist is said to have had his heart attack while in a herbarium gazing down at a specimen of Mentzelia from his beloved state of Utah. Warnock had his heart attack in the field gazing across an expanse of Creosote (Larrea tridentata). How appropriate for both! And as to their legendary status? Each was an epie figure in their own milieu, as it should be.

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Native Plant Society of New Mexico Newsletter. Tim McKimmie, 1105 Circle Drive, Las Cruces, NM 88005.

New Mexico Naturalist's Notes. P. Knight & R. Sivinski, eds. Sponsored by Marron & Associates, Inc. 7809 Fourth St. NW, Albuquerque, NM 87107. (505) 898-8848.

New Plant Distribution Records

New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition (herbarium) of a specimen.

— Richard Spellenberg (Dept. Biology, New Mexico State University, Las Cruces, NM 88003)
Polygonum aubertii L. Henry (Polygonaceae): Rio Arriba Co. (NMC).

— Kelly Allred (Dept. Animal & Range Sciences, New Mexico Staet University, Las Cruces, NM 88003
Bupleurum americanum Coult. & Rose (Apiaceae): Lincoln Co. (NMCR).

— Richard Worthington (P.O. Box 13331, El Paso, TX 79913)
Carex muriculata F.J. Hermann subsp. muriculata (Cyperaceae): Eddy Co. (NMCR).

— James McGrath (P.O. Box 2605, Tijeras, NM 87059)
Menyanthes trifoliata L. (Menyanthaceae): Rio Arriba Co. (UNM).

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New Mexico *Solidagos*: A Preliminary Look at a Difficult Problem, with a Tentative Key

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Introduction

Solidago in the Southern Rockies is beset with influences from the Great Plains, Mexico, and the Northern Rockies. However, within New Mexico, special and isolated environments may separate some of its variants from these other areas. Because most of its taxonomy comes from these other states and regions, published keys and articles may not take into account the unique variations within our state. These can best be understood as a nearly continuous variation of species radiating from central hubs or complexes. The distinctions are often very fine, which has led to many misidentifications. In studying all the *Solidago* in the herbaria at UNM, COLO, and Randall Davey Audubon Society, I have become convinced that careful attention to phyllary shape and orientation can be of great assistance in identifying the species. Below I will define three species complexes and make a preliminary attempt to describe characteristics which separate the species contained therein. Finally I will present a key to *Solidago* that incorporates these observations. This genus in New Mexico may have some distinct varieties not present elsewhere. I hope this treatment will provide a basis for a more general study of these interesting taxonomic problems.

Complexes

In New Mexico, variation in *Solidago* centers around three hubs or complexes which I denote by the species that seem to be central to each. It is gratifying that, after I had separated *Solidago* into these three complexes, I found that Guy Nesom (1993) had recognized nearly the same groups, and so I will note his terms for them as well as mine. (For brevity, only species epithets will be used when it is clear the discussion is about *Solidago*.)

1. *Simplex* Complex

Species included: *simplex*, *speciosa*, *multiradiata*, and *missouriensis*; included in section *Solidago* subsection *Solidago* by Nesom (1993), except for *missouriensis*, which he placed in section *Unilaterales* subsection *Junceae*.

Here the gradation runs from *speciosa* var. *pallida* to *simplex* var. *simplex*, then forks in two directions to *simplex* var. *nana* and to *multiradiata*. I include *missouriensis* in this complex, as it is difficult to separate from *multiradiata* if its inflorescence is not secund, although *multiradiata*'s relatively larger phyllaries and ray flowers might suffice.

2. *Velutina* Complex

Species included: *mollis*, *nana*, *nemoralis*, and *velutina* (including *sparsiflora*); included in section *Solidago* subsection *Nemorales* by Nesom (1993).

Here the gradation is less a continuous line and more a variation among individuals. All four were lumped together in *velutina* by Nesom (1989a), with an interesting discussion worth reading, but later treated as distinct (Nesom 1993). Certainly, they are difficult to separate, but I believe the attempt is at least instructive, and may serve to delineate some

variations unique to New Mexico. In several ways this is the most interesting and challenging complex in New Mexico.

Geography plays a role in identification in this complex. As one goes east towards the Great Plains, the variation tends toward *mollis* and *nemoralis*. As one moves north to lower elevations (below 7,000 ft.) the connection is to *nana*. Phyllary shape is also important. If we require that *velutina*'s phyllaries be acute/acuminate, as most manuals do, New Mexico material of *velutina* seems to have two additional expressions (see III. *Velutina* Phyllary Types, below). One may correspond to Wooton and Standley's (1915) more northerly *howelii*, and the other may represent an undescribed taxon. Also, I note that the Jemez Mountains seem to have a Great Plains signature with representation of both *speciosa* and *nemoralis*. Separation of the species in the *velutina* complex (especially *mollis*) is difficult and a special treatment appears below in addition to the key.

3. *Canadensis* Complex

Species included: *altissima*, *canadensis*, and *gigantea*; included in section *Unilaterales* subsection *Triplinerviae* by Nesom (1993).

The *Canadensis* Complex shows great variability and intergrading features (see Nesom 1989c), making species recognition difficult. For example, small specimens of *canadensis* (often with very narrow cauline leaves) and large specimens of *velutina* (in the *velutina* complex) are more often confused than heretofore recognized (Taylor & Taylor 1984), and occasionally mixed characters appear on the same specimen (collections I made around the town of Mogollon are particularly perplexing, exhibiting well defined characteristics of both species).

Phyllaries, a great aid in Solidago identification

Features traditionally used to distinguish the species in *Solidago* are panicle type (open panicle with secund branches versus thyrse), stem and leaf pubescence, and leaf venation (1 or 3 prominent veins). Lamentably, all of these characters seem to have their exceptions. I strongly suggest the use of phyllaries as reliable indicators or at least tie breakers.

Shape, surface nature, and degree of imbrication of the phyllaries are potentially robust indicators for distinguishing the various species and varieties. For example, phyllaries of *canadensis* differ so much from those of the *velutina* complex that, except in very rare cases, it is dead simple to separate the two even when other indicators are ambiguous. In nearly all cases there are additional features that correlate with phyllary characteristics so as to corroborate the identification. My point is that closer attention to phyllary characteristics is a powerful aid in taxonomy of New Mexico *Solidago* and perhaps elsewhere.

Within the *Velutina* Complex the phyllary characteristics are even more significant and nearly always definitive. For example, the rounded, pale, and half-cylindrical shape of phyllaries of *nemoralis* sets it off from the rest of the complex (excepting *nana* which is nearly identical to *nemoralis* but for its compact thyrse-like inflorescence). When this characteristic is combined with other characteristics (basal leaves present at flowering and one-nerved leaves) it helps establish a strong argument that *nemoralis* is one of the dominant *Solidago* in the Jemez Mountains around Los Alamos, where these specimens had heretofore been lumped with velutina. In addition, phyllaries segregate *velutina* itself into two (and perhaps three) varieties. Finally separation of *velutina* from *mollis* and *nana* is aided by examination of the phyllaries.

Within the *Canadensis* Complex phyllaries allow separation from hirsute specimens of *gigantea,* which in turn can be separated from *missouriensis* when sizes overlap. And the glutinous covering on phyllaries of *simplex* (when present) easily separates it from all species but it taller cousin, *speciosa*.

The following table summarizes phyllary characteristics.

Summary of Phyllary Characteristics (grouped by complex)				
Complex	Species	Shape	Imbrication	Surface
simplex complex	*simplex*	rounded, inner acute	3-4 ranks	usually glutinous
	speciosa	rounded, inner bluntly acute	3-4 ranks	sometimes glutinous
	multiradiata	long acuminate to acute	2-3 ranks	papery, ciliate margins

	missouriensis	rounded	3 ranks	similar to velutina #3, but thicker
canadensis complex	*canadensis*	narrowly acuminate	4-5 ranks	glandular
	altissima	usually acute	4-5 ranks	glandular
	gigantea	acute to long attenuate	1-2 ranks	glandular
velutina complex	*velutina* #1	rounded, innermost bluntly acute	3-4 ranks	some glandular tips
	velutina #2	acute & broadly attenuate	4-5 ranks	some glandular tips
	velutina #3	parallel with bluntly acute tips	3-4 ranks	hardly glandular tips
	mollis	similar to velutina #3, middle one broad	2-3 ranks	similar to velutina #3
	nemoralis	rounded	3-4 ranks	glabrous, lower half pale, middle often revolute
	nana	rounded to bluntly acute	4 ranks	usually like nemoralis

Velutina Phyllary Types

This species seems to have three distinct phyllary types, which I have named types 1, 2, and 3.

Type 1

Phyllaries rounded excepting at times innermost bluntly acute. These are not common but deserve study. Could these be *howelii*?

Type 2

Phyllaries all broadly attenuate-acute. This is perhaps the standard *velutina*. Most manuals indicate that *sparsiflora* (now included in *velutina*) has this type of phyllary.

Type 3

Phyllaries parallel and ending in a blunt point. Among the specimens at UNM this is the most common type--twice as common as type 2. UNM specimens of *mollis* exhibit this type. (COLO specimens of *mollis* do not, instead being thin and acute, more like type #2.)

It would be well to find out if these types occur out of state, but in New Mexico we may indeed have a distinct variety in type 3. Complicating this, is the additional problem that a few plants are mixed type 2/3 or 1/3, but these are exceptions to a rather well-defined set.

Additional characteristics. Specimens with type 2 phyllaries have leaves that are normally slightly narrower (4-6 times longer than wide) than those with type 3 (3-5 times longer than wide). Separation on the basis of leaf pubescence is less reliable since this varies from nearly glabrous to villous (when villous, it is well to be sure specimen is not *mollis* or *nemoralis*, which are generally much more hirsute). Note also that nearly all *velutina* cauline leaves are at least sparsely glandular, which further complicates separation from *canadensis*.

Identification within the _Velutina_ Complex

The following is an attempt at a separation of the species based on my observations and the literature. Despite variations, out of all this comes a distillate that seems workable, with the proviso that there will always be the exceptional deviant.

The four species can be completely divided by presence of creeping rhizomes and by inflorescence type.

	Open panicle with secund, recurved branches	Thyrse, with few, if any, secund branches
Creeping rhizomes	*velutina*	*mollis*
Caudex or short rhizome	*nemoralis*	*nana*

In addition, leaf features may help distinguish the species:

Basal leaves early deciduous, 3-nerved: *velutina* and *mollis.*

Basal leaves present at flowering time, 1-nerved: *nemoralis* and *nana.*

Specimens of *nemoralis* and *nana* from Colorado (at COLO) are nearly identical, differing only in inflorescence type, but being essentially identical in all other features. In New Mexico this may also be true (it seems to be so for the few specimens in my collection), but further study needs to be done. Interestingly, C. Taylor (pers. commun.) says she has seen few, if any, *nemoralis* in Colorado or New Mexico.

The biggest problem in New Mexico *Solidago* is identifying *mollis.* In fact, New Mexico specimens referrable to *mollis* may represent a distinct variation, differing from those occuring in Colorado in having type #3 phyllaries (rather than type #2) and smaller, narrower cauline leaves.

Generic Changes

Several species formerly in *Solidago* have been moved to more appropriate genera (see References):

Solidago graminea (Woot. & Standl.) Blake = Petradoria pumila (Nutt.) Greene subsp. graminea (Woot. & Standl.) L.C. Anderson

Solidago occidentalis (Nutt.) Torr. & Gray = Euthamia occidentalis Nutt.

Solidago parryi (Gray) Greene = Oreochrysum parryi (Gray) Rydb.

Solidago petradoria Blake = Petradoria pumila (Nutt.) Greene subsp. pumila

Solidago rigida L. = Oligoneuron rigidum (L.) T.C. Porter

Tentative Key to *Solidago* in New Mexico

This key is designed as a guide to identification of *Solidago* in New Mexico. Thus, it omits several species from surrounding states and concentrates on some interesting variations that seem to occur only in New Mexico. Most *Solidago* keys begin by separating species by differences in shapes of the inflorescence. While this is an important distinction in the evolutionary history of *Solidago*, I find it both confusing and often ambiguous (differing in young vs. mature plants), and so I have chosen to begin the key based on pubescence features. This characteristic is much easier for the observer to determine (although there are always odd cases), and follows the separation into complexes described above. This key is definitely "work in progress," and I would appreciate any comments on its accuracy, inadequacies, incisive modifications, etc.

1 Stems glabrous or nearly so

2 Flower heads secund or usually so

3 Plants short (<40 cm); basal lvs present at flowering time; cauline leaves few, narrowly oblanceolate, usually entire ... ***S. missouriensis*** (with three weak varieties; needs further study)

3 Plants tall (to >1 m); basal lvs absent at flowering time; cauline lvs abundant and large, lanceolate, usually dentate ... ***S. gigantea***

2 Flower heads not secund

4 Achenes glabrous ... ***S. speciosa*** var. ***pallida***

4 Achenes hirsute

5 Creeping rhizomes present ... ***S. missouriensis***

5 Creeping rhizomes absent

6 Basal leaf petioles with ciliate margins; heads and ray flowers 13 in number ... ***S. multiradiata***

6 Basal leaf petioles without ciliate margins; ray flowers 8 in number ... ***S. simplex***

7 Plants tall (15-60 cm), occuring below 12,000 ft ... var. ***simplex***

7 Plants short (about 15 cm), occurring above 11,000 ft ... var. ***nana***

1 Stems hirsute

8 Inflorescence thyrse-like, flower heads not secund (some specimens of *mollis* slightly secund)

9 Leaves 1-nerved; middle to upper cauline leaves elliptical to ovate ... ***S. wrightii***

10 Foliage and stems scabrous pubescent with stipitate glands ... var. ***adenophora***

10 Foliage and stems lacking stipitate glands ... var. ***wrightii***

9 Leaves 3-nerved (*mollis* weakly so); middle to upper cauline leaves oblanceolate to linear

11 Basal leaves absent at flowering time; cauline leaves broad, some dentate; creeping rhizomes present; middle phyllaries broadly acute, in about 3 ranks; inflorescence a compact thyrse with occasional lower branches recurved with secund flowers ... ***S. mollis***

11 Basal leaves present at flowering time; cauline leaves not much reduced, similar to basal leaves; caudex or short rhizome developed, creeping rhizome absent; phyllaries rounded, in 4 ranks, inflorescence a loose thyrse, flowers not secund ... ***S. nana***

8 Inflorescence a panicle, the flower heads secund

12 Leaves 1-nerved; basal leaves on long petioles and present at flowering time; phyllaries rounded, usually pale ... ***S. nemoralis***

12 Leaves 3-nerved; basal leaves absent at flowering time; phyllaries various, but not pale

13 Cauline leaves obviously reduced upwards, not noticeably crowded, entire to minutely dentate, oblanceolate becoming linear ... ***S. velutina*** (*S. mollis* with slightly secund branches may occur here)

13 Cauline leaves uniform in size, crowded, often obviously dentate, lanceolate

14 Stems below inflorescence glabrous; phyllaries acute, in 1-2 ranks ... ***S. gigantea***

14 Stems below inflorescence hirsute; phyllaries very long and attenuate, in 4-5 ranks

15 Heads 3-5 mm high ... ***S. altissima***

15 Heads 2-3 mm high ... ***S. canadensis*** (with two weak varieties; needs further study)

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Species List

Solidago altissima L.

Solidago arizonica (Gray) Woot. & Standl.

Solidago canadensis L. var. *arizonica* Gray

Solidago canadensis L. var. ***canadensis***

Solidago canadensis L. var. ***gilvocanescens*** Rydb.

Solidago gilvocanescens (Rydb.) Smith

Solidago gigantea Ait.

Solidago gigantea Ait. var. *leiophylla* Fern.

Solidago pitcheri Nutt.

Solidago missouriensis Nutt. var. ***fasciculata*** Holz.

Solidago glaberrima Martens

Solidago missouriensis Nutt. var. ***missouriensis***

Solidago marshallii Rothr.

Solidago missouriensis Nutt. var. ***tenuissima*** (Woot. & Standl.) C. & J. Taylor

Solidago tenuissima Woot. & Standl.

Solidago mollis Bartl.

Solidago multiradiata Ait.

Solidago ciliosa Greene

Solidago scopulorum (Gray) A. Nels.

Solidago nana Nutt.

Solidago nemoralis Ait. var. ***decemflora*** (DC.) Fern.

Solidago decemflora DC.

Solidago simplex Kunth var. ***nana*** (Gray) Ringius

Solidago spathulata DC. var. *nana* (Gray) Cronq.

Solidago decumbens Greene

Solidago simplex Kunth var. ***simplex***

Solidago aureola Greene

Solidago decumbens Greene var. *oreophila* (Rydb.) Fern.

Solidago glutinosa Nutt.

Solidago neomexicana Gray

Solidago oreophila Rydb

Solidago spathulata DC. subsp. *glutinosa* (Nutt.) Keck.

Solidago spathulata DC. var. *neomexicana* (Gray) Cronq.

Solidago speciosa Nutt. var. ***pallida*** Porter

Solidago velutina DC.

Solidago howellii Woot. & Standl.

Solidago sparsiflora Gray

Solidago trinervata Greene

Solidago wrightii Gray var. ***adenophora*** Blake

Solidago wrightii Gray var. ***wrightii***

Solidago bigelovii Gray

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[There are numerous reports and discussions concerning rare New Mexico plants on the New Mexico Rare Plant Technical Council web site: http://biology.unm.edu/~chelo/nmrptc1.html]

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Penstemon pulchellus Lindl. [= P. campanulatus (Cav.) Willd.]: A Specious Member of New Mexico's Flora

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Penstemon campanulatus (Cav.) Willd. (Scrophulariaceae) is a Mexican species that ranges from the mountains bordering the northern plateau southeastward to the Trans-Volcanic region (Straw 1963). The only record attributed to the U.S. is based on two collections made by Edgar A. Mearns, while he was with the U.S.-Mexico boundary survey of 1892-1894 (Mearns 1907). These specimens (nos. 2112 and 2222) were collected on 5 and 11 September 1893 in the San Luis Mountains (Warren L. Wagner pers. comm.), a primarily Sonoran and Chihuahuan range with a minor extension into New Mexico. These supposed U.S. occurrences were first reported by Wooton and Standley (1915), who referred them to *P. pulchellus* Lindl.--which Straw (op. cit.) considers a synonym of the nominate subspecies of *P. campanulatus*. Although Nisbet and Jackson (1960) followed Wooton and Standley in attributing these specimens to New Mexico, they went on to state that the existence [of this taxon in the state] is very doubtful. They also questioned the validity of *P. pulchellus* as a species, pointing out its close resemblance to *P. campanulatus* of central Mexico. Straw (op.cit.) went further, first in assigning Mearns 2222 to *P. campanulatus* ssp. *chihuahuensis* Straw, and then in attributing it to Chihuahua rather than New Mexico. However, he provided no explanation for the latter, nor did he make any mention of Mearns's other 1893 collection (no. 2112). Presumably as a consequence, several recent works have continued to list *P. campanulatus* (or "*pulchellus*") as a member of the floras of New Mexico (e.g., Martin and Hutchins 1981, Roalson and Allred 1995) and the U.S. (e.g., Kartesz 1998). Nonetheless, the available evidence supports the positions of Nisbet and Jackson (op. cit.) and Straw (op. cit.), notably in showing that both Mearns's *P. campanulatus* specimens almost certainly came from Mexico. Given this and the absence of any other known U.S. collection(s) of this taxon, I recommend that it be removed forthwith as a member of the floras of New Mexico and the U.S.

Thanks to W.L. Wagner (pers. comm.) of the U.S. National Herbarium (US), I was able to obtain the following details about these two Mearns's specimens of *P. campanulatus* ssp. *chihuahuensis*: no. 2112 (US 232994), base of San Luis Mts. up to 6000 ft., Sept. 5, 1893; no. 2222 (US 233447), cañon [on the] east side San Luis Mts., Sept. 11, 1893. Note that neither specimen has a state or country of origin, although Dr. Wagner informs me that 2112 was filed in the collection in a U.S./Canada folder and 2222 in a Mexican one. Unfortunately, this lack of geographic specificity typifies many plants and animals collected by Mearns et al. in the San Luis Mountains and vicinity, in contrast with material obtained elsewhere during the 1892-1894 boundary survey. For example, state and country are lacking for most bird specimens I have examined from that range, as well the majority of mammals cited in the only biological report published from the survey (Mearns 1907). I have no idea why material from this particular area so consistently lacks state/country of origin. However, it could simply result from an oversight that Mearns did not notice and obviously never corrected. For certain, I cannot believe that country of origin was omitted because of confusion about the boundary=s location, given the presence of surveyors and markers along the survey route. The same would have been true in locating New Mexico=s borders, although admittedly some confusion may have existed (and persisted) concerning the boundary between Chihuahua and Sonora.

In attempting to determine the country/state of origin of these two Penstemon campanulatus specimens, two potential sources of information come to mind. One is Mearns's field notes for his botanical collections, which Dr. Wagner (pers. comm.) has consulted for me and finds inferior in detail to the following. The second is the afore-mentioned report published by Mearns (1907), which besides a treatise on mammals contains detailed information on itineraries, descriptions of sites, and the biological activities of that boundary survey. Although neither of Mearns's specimens is mentioned, this report does detail collecting activities for the dates on which this material was taken. Starting with specimen no. 2222, Mearns (op.cit.:15, 88-90, and 143-144) indicated that his party began the day it was collected (September 11, 1893) at White Water (Station 16). This was a camp located on an arroyo (probably El Desaije) about one mile south of Monument 61 in Chihuahua. On that morning, the party rode to San Francisco Canyon (Station 18) on the east side of the San Luis Mountains, about 10 miles south of the boundary. In fact, the latter is doubtlessly the diagonal (and horseback) distance to this canyon, for Mearns also said the site was five miles southwest of Monument 63. There is indeed a San Francisco Canyon on the east side of the San Luis Mountains of Chihuahua, with its western branches lying five to seven miles due south of the boundary. However, this is a rather minor drainage, and it does not penetrate deeply or reach the higher elevations of these mountains. Given this, I suspect that Mearns and his party were actually in a drainage about a mile to the north, namely Cañón del Oso. Not only is this longer and deeper than San Francisco Canyon, but it clearly heads in the type of forested habitat (e.g., stands of Arizona cypress, *Cupressus arizonica* Green) mentioned by Mearns--and would more likely have contained the stream of water described. Whatever the case, Mearns indicated that "valuable collections were made here, as many of the species obtained belong to the Mexican fauna and flora, only crossing the United States line at a few points." After working its way up the canyon to "the high peaks" of the range (to ca. 7500 feet), the party apparently returned to camp lower down the drainage (or they might have returned to White Water). Either way, Mearns and the others remained in Chihuahua all day on September 11, 1893, meaning that specimen no. 2222 was indeed taken in that state--doubtlessly in the San Luis Mountains (as surmised by Straw 1963)--and quite likely in Cañón del Oso rather than San Francisco Canyon.

As for specimen no. 2112, it was collected on September 5, 1893--which was within a period (the first through ninth of that month) in which Mearns (op.cit.: 15, 89-93, and 144) and his party were camped at Lang's Ranch (or San Luis Spring), elevation 5174 feet, in the Animas Valley (Station no. 20). This site is located in extreme southern Hidalgo County, New Mexico, just north of the Mexican border and yards north of the present settlement of El Valle, Chihuahua. From this camp, Mearns and others explored nearby areas, including what he termed the "west [= northern, apparently mainly west and north of the Continental Divide] slope from the base to the summit" of the San Luis Mountains. Concerning the latter area, Mearns (op.cit.:90) went on to write that "a camp at the spring in Turkey Canyon, at a corresponding altitude [to upper "San Francisco" Canyon (= Cañón el Oso?) in the cypress zone] on the west side, [was a center] of collecting activity for several weeks [in 1892-1893]. A few lines later he indicated that he "made collections in the [San Luis] Mountains on...August 31 and September 1, 4, 5, 6, and 7, 1893, west side from base to summit, in the vicinity of Turkey Canyon." Based on these comments, it is clear that Mearns collected specimens in Turkey Canyon when his no. 2112 of *P. campanulatus* was taken (September 5, 1893). Furthermore, his plant list shows the site supported the type of habitats that would have favored this species, including the Arizona cypress and bigtooth maple (*Acer grandidentatum* Nutt.). Under the circumstances, I believe this specimen was indeed collected in that canyon, which almost certainly is what is now known as Cañón del Diablo. If this assessment is correct, then specimen no. 2112 was taken in Chihuahua at a point some three to five miles due south of the U.S. boundary.

Based on these reconstructions, both Mearns's specimens (nos. 2112 and 2222) of *Penstemon campanulatus* ssp. *chihuahuensis* were taken in Chihuahua, and therefore this taxon should be removed from the floras of the U.S. and New Mexico. If this recommendation is accepted, it will correct an error dating from the time of Wooton and Standley (1915). If not, then presumably proponents of a New Mexico origin of the material will marshal evidence contradicting the reconstruction presented here. In my opinion, not to be construed as such "evidence" would be Wooton and Standley's decision considering these as U.S. specimens in the first place. This is because that decision was seemingly arbitrary and subjective, rather than based on close study of factors such as specimen data, Mearns's itinerary, and the habitat requirements of the plant. In fact, the same flawed approach probably attended their review of other Mearns's specimens from the San Luis Mountains, with another likely error being attribution of *Eriogonum atrorubens* Engelm. to the U.S. flora (W. Hess pers. comm.). Furthermore, the misrepresentation of Mearns's records from there did not end with Wooton and Standley or plants, as is evident with some of the birds reported in Bailey (1928). Among the latter are three specimens of the blue-throated hummingbird, *Lampornis clemenciae* (Lesson), said to be from the Lang Ranch, July 11-12, 1892 (op.cit.:371). However, the labels state these came from the west side of the San Luis Mountains, where Mearns (1907:90) indicated a collecting camp was maintained in Turkey Canyon by his assistant Francis X. Holzner on July 11-23, 1892--exactly where this montane species would be expected. To return to *P. campanulatus*, just because Mearns did not collect it in New Mexico does not mean that it will not be found there some day. This would most likely occur during wet years, in which high seed production to the south and improved growing conditions everywhere might favor the species's northward expansion. Perhaps the New Mexico area with the highest potential for this would be the upper parts of Lang, Whitewater, or other canyons in the northernmost spur of the San Luis Mountains. In fact, a specimen has been collected in the Chihuahuan portion of this spur, about a mile south of the international boundary. This is NMC 53383, taken by Richard Spellenberg and Rob Soreng on October 10, 1982, just south of Highway 2 in an east-draining canyon [= Cañón de San Luis]. However, that site is still

undeniably in Mexico, and so this taxon's occurrence in New Mexico (and the U.S.) will remain unproved until an unquestionable authentic record is obtained from north of the boundary!

From a biological standpoint, whether Mearns collected *Penstemon campanulatus* in the San Luis Mountains of the U.S. or Mexico is of minor significance. After all, geopolitical boundaries have little to do with the natural world, as most are arbitrary and not expected to conform with or reflect patterns of biotic distribution. In fact many taxa in this particular region are shared between the two countries, including Mexican montane forms that extend into the border ranges in New Mexico and/or Arizona. On the other hand, regional biotas are typically defined in geopolitical terms, such as the flora of the U.S. or New Mexico. As a consequence, it is important to have the most accurate information possible on the ranges of component taxa. In addition, geopolitical boundaries can be a factor in the way taxa are managed, which may result in biological consequences. For example, a number of vertebrates common in Mexico are rare and local in the southwestern U.S., to the point of being listed as endangered or threatened taxa in states such as New Mexico. This listing in turn leads to improved management of wildlife habitat, which can benefit both listed and other organisms. Finally, some taxa do reach distributional limits in the U.S.-Mexican border region, as exemplified by the population of Penstemon campanulatus in the San Luis Mountains of Chihuahua (and doubtlessly adjacent Sonora). As such, these populations can provide insights into the parameters that control the distribution of given organisms, such as climate, resource availability, biological factors, and paleontological/historical events.

I wish to acknowledge first and foremost Warren L. Wagner, who did much to elucidate the flora of New Mexico's Animas Mountains (Master's Thesis at the University of New Mexico), where *Penstemon campanulatus* has been long sought but apparently never found. Dr. Wagner provided me with crucial information on E. A. Mearns's two specimens (nos. 2112 and 2222) of this species, which are housed in the U.S. National Herbarium. In addition, I also thank William Hess, Richard Spellenberg, and Rob Soreng for information they provided on plants in the San Luis Mountains and vicinity. Finally, I salute the excellent work of Dr. Mearns and his associates during the 1892-1894 boundary survey, without which we would not have these and many other biological specimens to study and learn from. I am certain they would be glad that the material is still being utilized, although not to the degree that it should be (or have been). In this regard, I would like to point out that Mearns prepared an extensive report that detailed the biological and related findings from that survey (Hume 1942). Unfortunately, the U.S. Congress failed to appropriate funds to publish the full report, and so only the first volume was ever printed (Mearns 1907). Perhaps the Smithsonian Institution or others should consider exhuming, updating, and publishing the remaining portion of the report, which would provide a unparalleled picture of the biota of the boundary at the close of the 19th century. Moreover, such a publication could also address other "specious" records like that of *P. campanulatus*, which persist even though over a century has passed since they were first obtained!

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New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition (herbarium) of a specimen.

— David Bleakly (3813 Monroe, NE, Albuquerque, NM 87110)

Symphyotrichum ciliatum (Asteraceae): San Juan Co. (UNM).

Atriplex heterosperma Bunge (Chenopodiaceae): Rio Arriba Co. (UNM).

— Kelly Allred (Box 3-I, New Mexico State University, Las Cruces, NM 88003)

Daucosma laciniata Engelm. & Gray (Umbelliferae): Hidalgo Co. (ARIZ).

Cotula australis (Sieb. ex Spreng.) Hook. f. (Compositae): Lincoln Co. (NMCR).

— Laird McIntosh (BLM, 1800 Marquess, Las Cruces, NM 88005)

Hedypnois cretica (L.) Dum.-Cours. (Compositae): Dona Ana Co. (NMC)

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Penstemon spinulosus Wooton and Standley: New Mexico endemic, error, or introduction?

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Penstemon spinulosus was described by Wooton and Standley (1913) on the basis of a George R. Vasey specimen (U.S. National Herbarium no. 156865), which was said to have been collected in June 1881 in the Magdalena Mountains, Socorro County, New Mexico. Since its description, this taxon has been variously treated --including as a full species (e.g., Wooton and Standley op. cit., 1915); a subspecies of *P. heterophyllus* Lindl. (Keck 1932, Lodewick and Lodewick 1987); and a synonym of *P. bridgesii* Gray [=*P. rostriflorus* Kellogg] (Tidestrom and Kittell 1941, Martin and Hutchins 1981, Roalson and Allred 1995). In other instances, its existence as a New Mexico taxon has either been overlooked/ignored (e.g., Nisbet and Jackson 1960; Kartesz 1998) or disputed (Bleakly 1998), assuming the latter's rejection of *P. heterophyllus* as a member of that flora actually refers to *P. spinulosus* --treated as a subspecies of that species. Given this range of opinions, a status review of this taxon would seem in order --if for no other reason than to summarize and update what is known about *P. spinulosus* for people interested in the plants of New Mexico.

In describing *Penstemon spinulosus*, Wooton and Standley (1913) gave the following diagnosis: "Stems slender, ascending, 20 to 30 cm. high, purplish, minutely puberulent; leaves linear-oblanceolate to linear-lanceolate, numerous, obtuse or acute, slightly reduced upward, glabrous, narrowed at the base to sessile, 5 cm. long or less; bracts linear-lanceolate, 1 to 2 cm. long; inflorescence few-flowered; pedicels short, stout; sepals 7 mm. high, the lobes lanceolate, rather abruptly acuminate, not scarious, glabrous, the tips spreading; corolla 3 cm. long, dilated in the throat, not bearded, the spreading limbs 2 cm. wide; stamens included; anthers sagittate, dehiscent for half their length, finely spinulose along the sutures." They also stated that "This is more closely related to *P. bridgesii* than to any other southwestern species, but it may be separated by the glabrous instead of glandular inflorescence and the much dilated corolla tube. Whether the corollas are red as in that species cannot be told from the faded dried specimens." Although not stated as such, the basis for this presumed relationship undoubtedly had to do with the means by which the anthers open (dehisce) to disperse pollen in these two species. In both, dehiscence occurs via a short suture, slit, or orifice across the connective, with the free tips of the anthers remaining closed (e.g., Nisbet and Jackson 1960). By contrast, in other New Mexico penstemons the anthers open from the free tips all or part way to the connective region. Incidentally, I assume that Wooton and Standley (op. cit.) selected the name *spinulosus* for this taxon because of the spines along this suture, as quoted above.

As far as I am aware, the next serious taxonomic treatment of *Penstemon spinulosus* following its description was by David D. Keck (1932), in the first of a series of landmark papers on the genus published through 1945. In the former, he accepted *spinulosus* as a valid taxon, but assigned it subspecific status under *P. heterophyllus* Lindl. of California. This determination was based on his study of the type specimen, which he cited as being from the Santa Magdalena Mountains of New Mexico. In discussing his findings, Keck (op. cit.:410) indicated that *spinulosus* was most like *P.heterophyllus* ssp. *purdyi* Keck of central and northern California, but differing in having the "teeth [spines] margining [the] orifice of the anthers stout, subulate, often curved, not crowded, [and] as much as 0.40 mm long." He further stated (op. cit.: 410 and 413) that "It cannot be said that *spinulosus* has any discernable strong morphological characters on which to stand. But it should be recalled that the only known collection came from a little-frequented portion of New Mexico so many years ago that it would seem certainly to be native to that region rather than an introduction by man. The type specimen is well faded and scarcely

complete enough to assure a complete comparison with purdyi. [However,] no California collection has been observed to have anthers directly comparable to those of spinulosus, so that the differences which at first appear trivial seem to be definite. Other characters have failed to disclose themselves but may be noted when the subspecies is recollected in New Mexico. Apparently this is a migrant from California at an early time when the desert region was a less imposing barrier to such a migration. At all events, *spinulosus* connects definitely with [*P.*] *heterophyllus* of California, rather than with any of the Utah or Great Basin species of the Section [*Saccanthera*]."

Although my review is not exhaustive, Keck's views on the taxonomic status of *Penstemon spinulosus* have apparently been accepted by most serious students of this genus. For example, in the most recent American *Penstemon* Society checklist (Lodewick and Lodewick 1987), *spinulosus* is listed as one of four accepted subspecies of *P. heterophyllus* --the others being restricted to California. However, for reasons that are not clear to me, Nisbet and Jackson (1960) made no mention of *spinulosus* in their monumental treatise on the penstemons of New Mexico. It is difficult to believe they overlooked it, for it certainly would have been noted in consulting Wooton and Standley (1913, 1915) during the course of their study. Perhaps instead they assumed that the taxon was described from an erroneously labelled specimen, i.e., one that had come from California rather than New Mexico. In fact, F.S. Crosswhite (pers. comm., Sep. 30, 1984) indicated to me that Keck may have later concluded this himself --although I have not found such a conclusion in print. Later works on New Mexico plants by Tidestrom and Kittell (1941), Martin and Hutchins (1981), and Roalson and Allred (1995) did treat *Penstemon spinulosus*, although all placed it in the synonomy of *P. bridgesii* Gray [=*P. rostriflorus* Kellogg]. I suspect this resulted from oversight rather than any disagreement with views expressed by Keck (1932), for these two taxa have little in common beyond the way their anthers dehisce. Finally, in a publication I have not seen (i.e., U.S.D.A. 1994--or is it 1997?), *P. heterophyllus* is listed as a New Mexico species--presumably based on Keck's (op. cit.) inclusion of spinulosus in that species. However, Bleakly (1998) rejects *P. heterophyllus* as a New Mexico species, whether the name is applied to the California species (as discussed above) or the Utah endemic *P. sepalulus* A. Nels. (of which he regards *P. heterophyllus* S. Wats. as a synonym; however, Lodewick and Lodewick [1987] consider the latter synonymous with *P. azureus* Benth. of Oregon and California).

Based on what is now known, I believe Keck's (1932) taxonomic assessment of *Penstemon spinulosus* is fundamentally correct --notably that this taxon is so similar to *P. heterophyllus* Lindl. as to be conspecific and thus included under that older name. As to whether *spinulosus* is a valid subspecies, it should be recalled that Keck found this taxon to differ in only minor degree from *P. heterophyllus* ssp. *purdyi*. In addition, *spinulosus* apparently remains known only from the unique type, which means its distinguishing characteristics rest on a single collection. As such, these could represent individual variation rather than the characteristics of an entire population. Thus, it seems safe to say that the infraspecific status of *spinulosus* is less certain than that at the species level. Beyond this, it should be empahsized that except for *spinulosus*, *P. heterophyllus* is otherwise a strict endemic of California. There, it is occupies an area extending from the southwestern to northwestern sections of the state (west of the Sierra Nevada), with an elevational range of 50 to 1600 m (Kartesz 1998). (It seems likely the species would also occur in northwestern Baja California, based on the availability of seemingly habitat there.)

Given the species's distributional metropolis in California, the authenticity of an alleged New Mexico specimen of *Penstemon heterophyllus* is certainly open to question --even if it does represent a distinct subspecies. Not only has *spinulosus* never been recollected, but *P. heterophyllus* is not known to occur in Arizona (Kearney and Peebles 1960) or even most of eastern California (Kartesz op. cit.). Surely, if the species were indeed relictual in western New Mexico (as presumed by Keck 1932), one would expect at least scatttered populations in the intervening area. In fact, a number of penstemons do display such a distribution, including *P. rostriflorus*, *P. eatonii* Gray, and *P. pseudospectabilis* M.E. Jones --which reach their eastern limits in western New Mexico. It should also be noted that *P. heterophyllus* is a member of the Section *Saccanthera* of the genus *Penstemon*, which contains 18-20 species found primarily in California and the Great Basin--with none in Arizona and only *P. heterophyllus* ssp. *spinulosus* allegedly from New Mexico (Lodewick and Lodewick 1987, Kartesz 1998). Taken together, this body of evidence suggests that regardless of its subspecific validity, it seems unlikely the type of *spinulosus* actually came from New Mexico. As a consequentce, the most likely explanation for the record is that the specimen was indeed mislabelled --having actually been taken in California rather than New Mexico.

As indicated earlier, the collector of the type of *P. spinulosus* was George R. Vasey (1822-1893), a respected botanist especially known for his studies of North American grasses (e.g., Vasey [and Richardson] 1889). As for his collecting plants in New Mexico, there is no question that he indeed did so between May and September 1881 (e.g., Wooton and Standley 1913). In fact, in addition to *Penstemon spinulosus*, that material also provided types for seven other plants described by Wooton and Standley (op. cit.). Moreover, additional of his 1881 collections were cited by those authors in discussing distribution in other New Mexico plants, including from Socorro and the Magdalena Mountains (Socorro Co.), Glorieta (Santa Fe Co.), and the Organ Mountains (Doña Ana Co.). Except for the type of *spinulosus*, I find no case in which Vasey's collection localities are at variance with those now known for plants in the state. Illustrative of this are other penstemons he collected there in 1881, of which I examined specimens of six species and subspecies (plus one hybrid) at the U.S. National Herbarium in 1991. These included material from what Vasey called "Santa Magdalena Mountain," namely a specimen of *P. jamesii* ssp. *ophianthus* (Penn.) Keck and another of the hybrid *P. thurberi* Torr. X *P. ambiguus* Torr. The latter bore the

additional term "plain" after the locality, no doubt in reference to grasslands north of the Magdalenas --where such a population was later studied by Nisbet and Jackson (1960).

Although suggestive, the above obviously does not preclude the possibility that Vasey incorrectly labelled some of the New Mexico plants he collected in 1881, most notably in the case of the type of *Penstemon spinulosus*. The fact is that virtually all collectors occasionally mislabel specimens, and quite likely Vasey was no exception to this rule. In fact, other evidence might do more to advance this possibilty, such as a revelation that Vasey was a chronic mislabeler of specimens, or that some of his 1881 material became intermixed with other collections. On the other hand, in the absence of such findings and given that Vasey did indeed collect plants in the Magdalenas that year, it is possible he actually did secure the type of *spinulosus* there. If so, this would fit Keck's (1932) perception of this taxon as a naturally-occurring population of *P. heterophyllus*, as disjunct from others in California it might be. However, another possibility is that the Magdalenas occurrence of this species resulted from an introduction by 19th-century humans.

While Keck (1932) believed the early date of collection mitigated against *Penstemon heterophyllus* having been introduced into the Magdalenas, he may have underestimated the potential for this to have occurred. While there were certainly no easy means of transit or largescale human movements from California to the Magdalena region as of 1881, horseback and wagon travel by a select few was another matter. For example, prospectors, miners, and their ilk had been moving about the western U.S. since the 1840-1850's searching for mineral riches, and that travel was certainly not limited to an east-to-west direction. In fact, Stanley (1973) wrote that "soldiers from California stationed in New Mexico during the Civil War made unsuccessful efforts to locate gold, silver, [and] copper" [in the Magdalena Mountains] --which would have been 15-20 years before Vasey's visit . By 1866, a promising mineral discovery had been made in the range, and an 1879 boom led by silver and then zinc resulted in the establishment of the mining town of Kelly (Julyan 1996). Miners and others flocked to the area from a variety of places, including California. By the beginning of 1880, at least 200 people were working in the area (Stanley op. cit.), and the population of Kelly eventually reached 3000 (Julyan op. cit.). Given these events, it is conceivable that seeds of *P. heterophyllus* could have found their way into wagons or packs in California, then been transported to establish a population of this species in the Magdalena Mountains. If this produced even a temporary population of the species there, Vasey could have collected specimens and never had an inkling the occurrence was anything out of the ordinary.

If 19th-century humans indeed brought *Penstemon heterophyllus* from California into the Magdalena Mountains, this would constitute the earliest introduction of a non-native penstemon into the wild in New Mexico. However, it would not be the only or last such instance, and in fact the process may be escalating --as discussed below. Among other likely examples was a population of *P. palmeri* Gray documented by Nisbet and Jackson (1960) in 1959, growing along U.S. Highway 66, some 70 miles east of Albuquerque in the Pedernal Hills, Torrance County. This occurrence represented the first confirmed state record of this species, but even earlier may have been a population in eastern Santa Fe County. The latter was along the Santa Fe Trail east of Santa Fe, where pointed out to me in the 1980's by a longtime resident (and wildflower enthusiast) --who said the species had been there for decades and had not been planted by anyone to his knowledge. In both cases, the New Mexico "colonies" were some 300 miles east of central Arizona, the nearest place where natural populations of the species occur (Kearny and Peebles 1960). Another obvious introduction is that of *P. cobaea* Nutt. of the humid southern Great Plains and vicinity, wild populations of which have been found 150 or more miles to the west in Sandoval, Taos, and Santa Fe counties (occurrences in Quay County might represent a natural population). These records date from the 1970's and 1980's, which coincides with rising local popularity of penstemons as cultivated plants --a factor that obviously increases the potential for non-native species to spread into the wild. (An even earlier arrival of this species at Flagstaff, Arizona led to the collection of what became the type for *P. hansonii* A. Nels. [Kearney and Peebles 1960]!). Finally, road and highway departments have also become agents in the extralimital dispersal of penstemons, namely through the inclusion of the seeds in mixes broadcast to stabilize and beautify transportation corridors. For example, there are several collections of *P. strictus* Benth. from along roadways in Catron and Grant counties, where this Rocky Mountain species is certainly not native and was unknown in the wild before the 1970's.

Of the three scenarios discussed here, mislabelling is admittedly the most plausible explanation for the alleged occurrence of *Penstemon heterophyllus* in New Mexico's Magdalena Mountains in 1881. While this scenario may not be supported by evidence presented here, it certainly deserves further examination --including along a number of additional avenues of inquiry. For example, if Vasey kept a catalog, journal, and/or notes, these might contain some indication of whether he indeed collected this penstemon in New Mexico. In addition, a comparison of the type of *spinulosus* with other Vasey material might also prove useful, including to confirm this was indeed one of his specimens. Yet other insights might be gained from examination of the U.S. National Herbarium catalog, such as determining when, by whom, and other details concerning the accessioning of the type into that collection. In the case of the date, this obviously could have been any time after the type was collected (1881) and before *spinulosus* was described (1913). It may be the longer it took to accession the specimen, perhaps the more likely it may have been mislabelled. As for Vasey himself, it would be would be interesting to know when and if he ever collected plants within the range of *P. heterophyllus* --especially prior to the accession date of the type of *spinulosus*.

Clearly, if evidence emerges suggesting the type of *Penstemon heterophyllus* ssp. *spinulosus* did not come from New Mexico, then the taxon should be deleted from the flora of the state. However, if such is not forthcoming, then the possibility will remain that the record is valid on its face --which means the type could have indeed originated in New Mexico. Given this, what factors might help determine whether this represents a relictual or an introduced population? As indicated earlier, although Keck (1932) found only minor differences between *spinulosus* and other *P. heterophyllus* populations, he considered these adequate to accord the former subspecific status. However, a restudy of specimens might provide new insights into geographic variation in this complex, with particular emphasis applied to the anther characters used by Keck to distinguish *spinulosus*. Once completed, two possible outcomes might result --the first showing that *spinulosus* characters are also present in California populations of *P. heterophyllus*, and the second that they are not. If the characters hold up, this would support Keck's perception of *spinulosus* as a relictual population of this species. If they do not, this would argue for "spinulosus" resulting from a recent introduction of *P. heterophyllus* into New Mexico (or a mislabelled collection). However, a possible complication is that some characters in this complex may vary ecotypically, e.g., the teeth around the anther sutures could be better developed in plants growing in more arid areas. If this were the case, then a population of *P. heterophyllus* in the Magdalenas could prove divergent but still be introduced!

My point is that no guarantee exists that further study will fully resolve questions concerning the origin of the type and thus the status of *Penstemon heterophyllus* ssp. *spinulosus* (Wooton and Standley) Keck. Thus, one may still end up having to choose among scenarios in seeking such resolution, which could then decide this taxon's place in the state's flora. Whatever the choice, hopefully it will be arrived at through the broadest and most objective approach possible, rather than subjective or arbitrary judgment. No taxon deserves the latter treatment, even though this has been the fate of *Penstemon spinulosus* by dent of its being ignored, incorrectly synonymized, or dismissed because of doubts about its legitimacy as a member of New Mexico's flora. Indeed, until and even after its status is resolved, both the type and the taxon it spawned should continue to be matters of interest --if not attention --for New Mexico botanists. After all, the process of determining the status and relationships of living organisms is ongoing, and today's dictum may be tomorrow's erroneous conclusion. If anyone doubts this, a case in point is *Penstemon metcalfei* Wooton and Standley, a taxon described from the Black Range and long relegated to the synonymy of *P. whippleanus* Gray (e.g., Keck 1945). Quite to the contrary, Todsen (1998) has shown that *P. metcalfei* is in fact a distinctive member of the *Oliganthi* alliance, which in New Mexico consists of four other nominal species (Crosswhite 1965). Oddly enough, no member of this group had previously been reported from the Black Range, and now we can see why! Who knows? Perhaps further inquiry will be equally revealing in the case of *Penstemon heterophyllus* ssp. *spinulosus*, which certainly populates New Mexico's botanical archives --if not a site somewhere in the wild.

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An Investigation of *Salsola* L. (Chenopodiaceae) in New Mexico

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Abstract

There are currently only two verified species of *Salsola* in New Mexico: *S. collina* Pallas and *S. tragus* L. The former is a recent introduction characterized by elongate flowering branches, appressed flowering bracts, and wingless fruits. The latter has been known in New Mexico since 1894, has a checkered and difficult nomenclature, and is characterized by reddish stem striations, soft and semi-succulent seedling leaves, long narrow cauline leaves, recurved flowering bracts, central perianth segments that are rounded, lax, and spreading, and winged fruits. *Salsola paulsenii* Pallas is not known definitely from New Mexico, but a few specimens may represent hybrid derivatives or intermediates suggestive of this species.

Introduction

The genus *Salsola* L., in the family Chenopodiaceae, comprises as many as 150 species world-wide, with both herbaceous and shrubby members. Of the six or seven species occurring in the United States, all may be considered alien introductions from Eurasia, some perhaps naturalized (Kartesz 1994; Mosyakin 1996).

The species are widespread throughout much of North America, regularly occurring in disturbed, often dry and barren, habitats, and commonly considered undesirable or noxious weeds. They go by various common names, including Russian thistle, saltwort, saltbush, tumbleweed, wind witch, and Russian cactus.

The genus is characterized by the following features: flowers bisexual and solitary (rarely in 2s or 3s) in the axils of bracts; perianth segments 5 (corolla lacking), at maturity covering the fruit and in many species developing wings, or wingless; stamens 5; styles and stigmas 2; pericarp adherent; seed horizontal.

Until recently, it was thought that only a single species was present in New Mexico (Martin & Hutchins 1981). The report of a second in 1995 (Roalson & Allred 1995) and a third in 1996 (Mosyakin 1996) prompted this investigation. Our purposes were to verify what species were present in the state and to document their distributions. The investigation was not meant to be a taxonomic revision of the species, but more floristic in nature, as we were concerned strictly with New Mexico populations.

Historical Aspects

Salsola was first noticed in New Mexico in the fall of 1894. The October issue of "Southwestern Farm and Orchard" of that year carried an announcement that Russian thistle had been found at Santa Fe and included a warning to the farmers of the territory about its noxious character (Wooton 1895). A note affixed to a specimen (at NMC) collected in 1896 by S.S. McKibbin from Lamy, New Mexico, records that he "has seen it for two years in this locality," corroborating the 1894 observation. An early agricultural bulletin identified the plants as *Salsola kali* L. var. *tragus* (L.) Moq. and reported its occurrence in New Mexico Territory only in Santa Fe County and perhaps Chaves County, near Roswell (Wooton 1895). By 1915 the plant was reported as "one of the commonest introduced weeds, ...to be found in practically every locality in the State except in the higher mountains" (Wooton & Standley 1915). The most recent accounting for New Mexico characterized

the distribution as "widespread" and mapped its occurrence in 19 of the state's 32 counties (Martin & Hutchins 1981).

Beatley (1973) called attention to an over-looked species in western United States, *Salsola paulsenii* Pallas, and reported it from Arizona, California, Nevada, and Utah. It was not reported for New Mexico by either Wooton and Standley (1915) nor Martin and Hutchins (1981), but a specimen from Luna County seemed to fit this species and it was listed for the state by Roalson & Allred (1995).

Salsola collina Pallas was first reported for the state by Mosyakin in 1996, but a search of herbarium specimens revealed the earliest collection of this species to be in 1952 from the Sacramento Mountains in Otero County, though it was not correctly identified until this review was undertaken.

Previous Work and A Synopsis of the Diagnostic Features

Uncertainty about the identity of *Salsola* species is presaged by a profusion of names and synonyms, at least for the common Russian thistle plant found throughout the state (Table 1). We follow here the classification scheme employed by Gleason and Cronquist (1991) and Mosyakin (1996), which recognizes the main taxa at the specific level, rather than a slightly more conservative approach that elaborates the variation at the subspecific level, as represented by Kartesz (1994).

Salsola collina. Beginning with the first report for the United States (Moore 1938) and in subsequent early reports (Cory 1948; Gleason 1952; Schapaugh 1958) there has been no confusion about the identification of *S. collina*. This species is characterized by the following features (Table 2): flowering branches noticeably elongate and virgate, hardly prickly; bracts imbricate and appressed to the flowering branches, only spreading at the tips; central perianth segments rounded at the apices, lax, and spreading; fruiting wings absent or essentially so. Plants of *S. collina* are rather easily determined, and the difference in growth form is conspicuous when growing with S. tragus. The lack of perianth wings in fruit is especially diagnostic.

Salsola paulsenii. Beatley's (1973) characterization of *S. paulsenii* for North American plants has been followed in essentially all subsequent treatments (Table 2): plants prickly from the seedling stage through maturity, yellow-green when young, pale to straw-colored when mature; stems not or hardly striated; cauline leaves short (< 2 cm) and thick (> 1, mostly 1.5-2, mm), strongly stiff and spinose even when young; central perianth segments acute at the apices, spinose, and erect; fruiting wings prominent, 6-12 mm in diameter.

Salsola tragus. As seen by the overabundance of scientific names applied to this taxon, *S. tragus* has been the source of confusion, both taxonomic and nomenclatural, since it was first found in the United States, having arrived with flax seed in South Dakota in 1873 or 1874. Although there is some overlap in features according to various authors who treat two or more of the species in question, this species has generally been characterized by the following (Table 2): plants soft and not at all prickly in the seedling stage, becoming stiff and prickly with maturity; stems with red striations; cauline leaves relatively long (2-8 cm) and narrow (< 1 mm), soft and succulent in young plants, rigid and spinose in mature plants; central perianth segments rounded at the apices, lax, and spreading; fruiting wings prominent, 3-6 mm in diameter (though Mosyakin [1996] allows up to 10 mm diameter in this species).

The Identification of New Mexico Plants

In an attempt to correctly determine which species occur in New Mexico, we examined all the specimens of New Mexico *Salsola* (132) from the herbaria at New Mexico State University (NMC and NMCR), San Juan College (SJC), University of New Mexico (UNM), and White Sands Missile Range, as well as a few representative specimens of *S. paulsenii* from Missouri Botanical Garden (MO) that had been identified as such by Beatley or Mosyakin (none from New Mexico). Features emphasized by various authors as being diagnostic for one species or another (Table 2) were compared with the variation present in New Mexico plants, with the following observations.

Salsola collina. Three plants were determined as *Salsola collina*, from Lincoln, Otero, and Santa Fe counties. In addition, this species was seen by Forbes in southern McKinley County in October 1998, but not vouchered by an herbarium specimen. Each specimen was typical, with elongate inflorescence branches, appressed bracts, and wingless fruiting perianth.

Salsola tragus and *Salsola paulsenii*. Most of the remaining plants were easily identified as *Salsola tragus*, as characterized above. Many of the specimens were immature, without flowers or fruits, but with long, semi-succulent, soft leaves and prominent red striations on the stems typical of *S. tragus*. None of these immature specimens exhibited leaves or stems that resembled those of *S. paulsenii*: short, stiff, thickened leaves and pale stems lacking striations. Occasionally, a small (but mature fruiting) specimen may mimic a *paulsenii* seedling in size and in having prickly leaves, but the presence of fruits

allows one to determine that the specimen is not a seedling and that the prickly leaves are not seedling leaves. This was the case with the plant that was the basis for the report off *S. paulsenii* in Roalson and Allred (1995).

None of the specimens with mature fruits exhibited the spinose, erect-appressed, acute central perianth segments that both Fuller (1986) and Mosyakin (1996) emphasized as characteristic of *Salsola paulsenii*.

Many authors (see Table 2) relied upon leaf width and fruiting perianth (wing) diameter to distinguish these two species. New Mexico specimens with both cauline leaves and mature fruiting structures were plotted for these two features (Fig. 1). Plants representative of *S. paulsenii* should fall in the larger circle, with wide leaves (> 1 mm) and large wing diameters (6-12 mm), and those representative of *S. tragus* should fall in the smaller circle, with narrow leaves (< 1 mm) and smaller wing diameters (3-6 mm). Most of the plants aligned with *S. tragus* on these features; only one plant fell within the *paulsenii* plot. This was a plant gathered from Taos County in 1907 (Adair s.n., UNM) that seemed to be intermediate between these two taxa. Lack of stem striations, short thick leaves, and large wings implied *paulsenii*, though the leaves were not as thick and stiff as typical *paulsenii*; central perianth segments that were blunt, lax, and not at all spinose suggested *tragus*. Beatley (1973) reported hybrid swarms between the two species where they grow together, but noted that *S. paulsenii* seemed to be the more common species at lower elevations. The Adair specimen is problematical. Perhaps it represents one of these intermediate hybrid derivatives that found its way to Taos in 1907 but has failed to survive? When compared with the verified specimens of typical *S. paulsenii*, we were unconvinced that it belonged to that species, and prefer to treat it as an intermediate form.

We note also the numerous specimens with large wing diameters, but with narrow leaves (which were all longer than 2 cm) (Fig. 1). These would all be aligned with *S. tragus* by Mosyakin (1996), who extended wing diameter to 10 mm for this species and relied heavily on the spinose nature of the central perianth segments to identify *S. paulsenii*. As with the Adair specimen, these might represent hybrid derivatives (not hybrids themselves) between the two species.

There were a few other plants that might be mistaken for *Salsola paulsenii* because of their extremely prickly nature. These were all robust, mature plants with elongate inflorescences and well-developed fruits subtended by short thick flowering bracts suggestive of the cauline leaves of *S. paulsenii*. However, they had reddish stem striations, long narrow cauline leaves, small diameter fruiting wings, and non-spinose central perianth segments characteristic of *S. tragus*. None of their features in reality aligned with *S. paulsenii*; it was their extreme robustness that tended to confuse.

Nomenclature and Synonymy

We follow here the nomenclature and classification of Mosyakin (1996), and have taken the synonymy from him, Jones et al. (1997), and Kartesz (1994).

Salsola collina Pallas

Salsola tragus L., Cent. Pl. 2:13. 1756.

Salsola kali L. var. *tragus* (L.) Moquin-Tandon

Salsola kali L. subsp. *tragus* (L.) Celakovsky

Salsola kali L. subsp. *tragus* (L.) P. Aellen

Salsola australis R. Brown

Salsola kali L. subsp. *tenuifolia* I. Tausch, nomen nudum

Salsola kali L. var. *tenuifolia* Moquin-Tandon

Salsola kali L. var. *angustifolia* Fenzl

Salsola kali L. var. *leptophylla* Bentham

Salsola tragus L. subsp. *iberica* Sennen & Pau

Salsola iberica (Sennen & Pau) Botschantzev ex Czerepanov

Salsola kali L. var. *pseudotragus* G. Beck

Salsola pestifer A. Nelson

Salsola ruthenica Iljin

Salsola kali L. subsp. *ruthenica* (Iljin) Soó von Bere

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Table 1. Scientific Names[1] Applied to *Salsola* Species by Various Authors

	Salsola tragus	***Salsola paulsenii***	***Salsola collina***
Wooton 1895	*S. kali* var. *tragus*	-	-
Wooton & Standley 1915	*S. pestifer*	-	-
Tidestrom 1925	*S. pestifer*	-	-
Munz & Keck 1968	*S. kali* var. *tenuifolia*	-	-
Kearney & Peebles 1969	*S. kali* var. *tenuifolia*	-	-
Correll & Johnston 1970	*S. kali*	-	-
Beatley 1973	*S. iberica*	*S. paulsenii*	*S. collina*
Botschantzev 1974	*S. australis*	-	-
Martin & Hutchins 1981	*S. kali* var. *tenuifolia*	-	-
Crompton & Bassett 1985	*S. pestifer*	*S. paulsenii*	*S. collina*
Fuller 1986	*S. australis*	*S. paulsenii*	-
Gr. Pl. Flora Assoc. 1986	*S. iberica*	-	*S. collina*
Gleason & Cronquist 1991	*S. tragus*	-	*S. collina*
Weber & Wittmann 1992	*S. australis*	-	*S. collina*
Welsh et al. 1993	*S. pestifer*	*S. paulsenii*	*S. collina*
Hickman 1993	*S. tragus*	*S. paulsenii*	-
Kartesz 1994	*S. kali* subsp. *tragus*	*S. paulsenii*	*S. collina*
Mosyakin 1996	*S. tragus*	*S. paulsenii*	*S. collina*
Jones et al. 1997	*S. tragus*	-	-

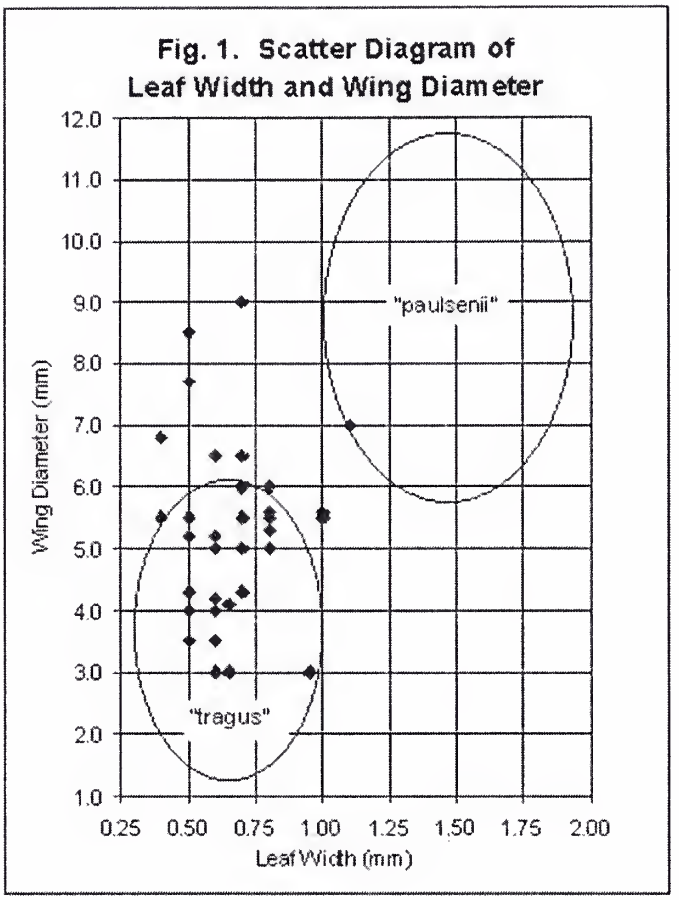
[1] Authorship of the names is supplied in the Nomenclature section.

Table 2. Characterization of the species of *Salsola* attributed to New Mexico based on representative sources prior to this study[1]

	S. tragus	***S. paulsenii***	***S. collina***
Plant color	Blue-green[a]	Yellow-green[ad]	Green[e]
Seedling form	Soft, lax, not prickly[ab] Branches not cruciform [a]	Stiff, rigid, prickly[ab] Branches cruciform[a]	-

Mature form	Stiff, prickly[ab]	Stiff, Prickly[ab]	Scarcely prickly[a]
Stem striations	Reddish[ace]	Lacking, or pale reddish[ae]	Green or red-streaked[ce]
Leaves, pre-fruiting	Lax, not rigid nor prickly[a]	Rigid & prickly[ae]	Lax, not rigid nor prickly[a]
Cauline leaf length (cm)	2[a] 2-8[c] 1.5-6[e]	0.5-1.5[a] 0.5-2[d]	2-6[ce]
Cauline leaf width (mm)	Commonly 0.5, < 1[ad] 1[c] 0.3-0.8[e]	1-1.5[ad] 1-2[d]	1[ce]
Flowering bracts, mature	Reflexed[cde]	Reflexed[d]	Appressed, imbricate[cde]
Calyx segment apices	Rounded, lax, spreading[bd]	Acute, spinose, erect[bd]	Lax, not spinose, spreading[d]
Fruiting calyx wing length (mm)	< 2 [ae]	3-4 [a] 2-4 [d]	Not winged[acde]
Fruiting calyx wing diameter (mm)	3-4[b] 3-5(6)[c] 4-10[d]	6-7[b] 7-12[d]	Not winged[acde]

[1] According to [a]Beatley (1973), [b]Fuller (1986), [c]Great Plains Flora Assoc. (1986), [d]Mosyakin (1996), and [e]Welsh et al. (1993)



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Rare, Threatened, and Endangered Plants:

[There are numerous reports and discussions concerning rare New Mexico plants on the New Mexico Rare Plant Technical Council web site: http://biology.unm.edu/~chelo/nmrptc1.html]

Journals, Newsletters, Etc.:

Native Plant Society of New Mexico Newsletter. Editor: Tim McKimmie, 1105 Circle Drive, Las Cruces, NM 88005 🕮

New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition (herbarium) of a specimen.

— Robert Sivinski (Box 1948, Santa Fe, NM 87504), garden escapes:

Symphytum officinale L. (Boraginaceae): Santa Fe Co. (UNM).

Nepeta cataria L. (Lamiaceae): Santa Fe Co. (observation).

Pyracantha coccinea Roemer (Rosaceae): Bernalillo Co. (UNM).

— James McGrath (Box 2605, Tijeras, NM 87059)

Phytolacca americana L. (Phytolaccaceae): Eddy Co. (UNM)

Carex diandra (Cyperaceae): Rio Arriba Co. (UNM)

Juncus hallii Engel. (Juncaceae): Rio Arriba Co. (UNM) 🕮

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In This Issue —

A Taxonomic Study of *Philadelphus* (Hydrangeaceae) as It Occurs in New Mexico*

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Abstract

All specimens of *Philadelphus* in the UNM herbarium from New Mexico were examined and measured to evaluate the representation of this genus in the state. Ninety-eight specimens were scored for 31 morphological characters to create a data set which was then used for principal component analysis. These multivariate analyses were combined with a review of the quality of characters used in previous monographs by Rydberg (1905), Hitchcock (1943) and Hu (1956) and an analysis of the geographic variation of character states in New Mexico. Together, these lines suggest that the current number of recognized *Philadelphus* taxa in the state (Martin and Hutchins 1980) is inflated. Examination of *Philadelphus* in the field and in other herbaria is necessary before this work may be considered complete, however, a tentative conclusion is that there are only 4 *Philadelphus* taxa in the state in 2 species: *P. mearnsii, P. microphyllus* subsp. *microphyllus*, *P. microphyllus* subsp. *argenteus* and *P. microphyllus* subsp. *argyrocalyx*.

Introduction

Nine species of *Philadelphus* have been reported from New Mexico in the most recent floristic treatment for the state (Martin and Hutchins 1980) with one, *P. microphyllus*, having two recognized varieties. The nomenclature used in the Flora of New Mexico (Martin and Hutchins 1980) and in the latest checklist of New Mexico species (Kartesz 1994) follow the nomenclature and distributional notes in the most recent systematic treatment for the genus as a whole (Hu 1956). Seven of the New Mexico taxa are placed by Hu (1956) in the subgenus Philadelphus, section Microphyllus (Koehne) Hu: *P. argenteus* Rydb., *P. argyrocalyx* Woot., *P. madrensis* Hemsl., *P. microphyllus* Gray var. *microphyllus*, *P. m.* var. *ovatus* Hu, *P. occidentalis* A. Nels. var. *occidentalis*, and *P. wootonii* Hu. In the subgenus Deutziodes Hu, Hu placed three other New Mexico *Philadelphus*: *P. hitchcockianus* Hu and *P. mearnsii* W. H. Evans ex Rydb. (in the section Pseudoserpyllifolius Hu) and *P. serpyllifolius* Gray (in the section Serpyllifolius Hu). Six of the ten taxa reported to be found in New Mexico by Hu have their type localities in-state, making study of the New Mexico specimens particularly germane to the systematics of these species.

Taxonomic history of *Philadelphus* in New Mexico

The first known xerophytic species of *Philadelphus*, *P. microphyllus*, was described in 1849 by Asa Gray, based on a collection by Fendler from Santa Fe. In the first monograph of the *Philadelphus* of North America, Rydberg (1905) referred to six New Mexico species, all placed in the Microphylli group of *Philadelphus*. This included the three previously described species, *P. microphyllus* A. Gray 1849, *P. serpyllifolius* A. Gray 1852 and *P. argyrocalyx* Woot. 1898, as well as three species described by Rydberg (1905) from Southern New Mexico; *P. argenteus* Rydb., *P. mearnsii* W. H. Evans ex. Rydb. and *P. ellipticus* Rydb.

The first Flora of New Mexico (Wooton and Standley 1915) listed only four New Mexico *Philadelphus*: *P. argyrocalyx*, *P. argenteus*, *P. microphyllus* and *P. mearnsii*. Wooton and Standley argued that the type of *P. ellipticus* Rydberg 1905 had an incorrect locality and that the specimen was in all respects identical with the type of the previously described *P. argyrocalyx* Woot. *P. serpyllifolius*, listed by Rydberg (1905) as distributed from "rocky places of Western Texas and New Mexico" was not included in the Flora of Wooton and Standley, nor explicitly synonymized with any of the included species.

* An expanded version of this paper including more detailed results of the analyses, taxa descriptions, distribution maps, materials examined and additional notes on taxon specific characters, biogeography and delimitation is available

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Botanice est Scientia Naturalis quae Vegetabilium cognitiorem tradit.
— Linnaeus

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upon request from the author.

Hitchcock (1943) monographed the xerophytic *Philadelphus* of the southwest and reduced five of the Microphylli group species recognized by Rydberg into subspecies of *P. microphyllus*. This included two species from New Mexico, *P. argyrocalyx* and *P. argenteus*. Nevertheless, disregarding differences in rank, Hitchcock's list of New Mexico species is the same as that of Wooton and Standley (1915). Hitchcock did cite one New Mexico locality for *P. serpyllifolius* in his "material seen" section, but this is for the type which is from "between western Texas and El Paso, New Mexico" (sie). Hitchcock's distribution map for *P. serpyllifolius* (his Fig. 1) shows its range to be entirely within Texas.

Hitchcock (1943) did offer some taxonomic changes affecting the understanding of *Philadelphus* in New Mexico. First, he included two Mexican species, *P. palmeri* Rydb. and *P. madrensis* Hemsl. 1908, in synonymy with the type of *P. argenteus* (*P. microphyllus* subsp. *argenteus* Rydb. (Hitchcock)). Hitchcock also suggests that the *P. asperifolius* Koern 1867 (recognized by Rydberg 1905), another Mexican species, may be synonymous with *P. argenteus*, although in absence of proof of its identity, he simply did not use the name.

Hitchcock described a number of other subspecies of *P. microphyllus*, though none from our area. Interestingly, the distribution of *P. microphyllus* subsp. *occidentalis* (Nels.) Hitchcock (in which Hitchcock included *P. occidentalis* Nels., *P. minutus* Rydb. and *P. nitidus* Nels.) is shown in his Fig. 1 overlapping the far northwest corner of New Mexico. None of the 44 specimens cited under "material seen" for this taxon, however, is from New Mexico.

Hu's comprehensive monograph of the entire *Philadelphus* genus (1956) changes the taxonomy of New Mexico *Philadelphus* more than any revision this century. Hu moved *P. serpyllifolius* and *P. mearnsii* to separate subgenera from the rest of the Microphyllus group, and ranked the latter as one section within the Philadelphus subgenus. Within the Microphyllus section, Hu recognized all three Rydberg 1905 species from New Mexico at the specific rank and elevated all of Hitchcock's subspecies of *P. microphyllus* to the specific rank as well. Hu described one new New Mexico species of Microphyllus section *Philadelphus*, *P. wootonii*, which is sympatric with and morphologically similar to the rare endemic *P. argyrocalyx* and two new varieties of *P. microphyllus,* var. *ovatus* from New Mexico and var. *linearis* from Arizona. Hu split *P. minutus* and *P. nitidens* out from *P. occidentalis* and placed them in the taxon *P. occidentalis* var. *minutus*. *P. occidentalis* var. *occidentalis*, which was originally described as a rare species from a single locality in Colorado by its author, was now given a range spanning from California to Texas, including localities in central and southern New Mexico. *P. madrensis* was resurrected out of *P. argenteus* and its range extended from Mexico into New Mexico. Hu also located *P. serpyllifolius* clearly within New Mexico on his distribution map for the section (near Columbus), but as with Hitchcock, his only cited material from New Mexico was the type specimen from "between western Texas and El Paso, New Mexico" (sic). Finally, *P. mearnsii*, which Hitchcock had split into two subspecies, was now split by Hu into four species, two of which, *P. mearnsii* and *P. hitchcockianus* Hu, were said to be found in New Mexico. Hu is thus responsible for swelling the number of New Mexico Philadelphus from the four taxa recognized from 1915 - 1956 to the ten taxa now currently accepted.

P. mearnsii was removed from candidacy for the Federal Endangered Species List based on a status report (Spellenberg 1981) that indicated a much broader range in southern New Mexico, Texas and Mexico than previously indicated. This report, despite having mandated sections on taxonomy and nomenclature, did not discuss the relationship between *P. mearnsii* and the closely related or synonymous *P. hitchcockianus*. Furthermore, two of the cited populations for *P. mearnsii* were syntype localities for *P. hitchcockianus*.

Evaluation of morphological characters in the classification of the genus

A number of characters have been considered taxonomically important by one or more of the three main reviews of *Philadelphus* this century. There has not been agreement among these sources as to which characters are most effective in distinguishing taxa and authors have used characters in their treatments that they admit in other sections to be of suspect value for taxonomic decisions. In the following section, I evaluate a number of the characters stressed by others as taxonomically valuable, concentrating on those of Hu (1956), and discuss my interpretations of which are most useful and reliable.

Growth form and stem characters: Plant habit is of limited importance with respect to an herbarium study of the genus since it cannot be directly observed on herbarium specimens. Hu (1956) characterized the sections Pseudoserpyllifolius and Serpyllifolius as "dwarf shrubs" in his synopsis of characters for subgenera and sections, although elsewhere he specifically downplayed the importance of habit for separating major groups of *Philadelphus*. Hu allowed that habit may be informative for distinguishing taxa up to the rank of species although it was not a key character for New Mexico species in any of the three major treatments (Hu 1956, Hitchcock 1943, nor Rydberg 1905). All three authors included habit in their species descriptions; Hu, for example, included information concerning plant height, growth form (erect, fibrous or calcarate) and branching structure (loose or spinescent). Since it is unclear whether any of these descriptions are based on observations in the field, they may be somewhat suspect with respect to this character.

Hu (1956) discussed four subsets of stem characters: second year's growth, current year's growth, the axillary buds and the adventitious growth. Bark color and exfoliation, he states, are of little taxonomic use due to within-plant variation and the vagaries of sampling shrubs for herbarium specimens. Nevertheless, in Hu's keys, *P. mearnsii* is distinguished from *P. earnestii* in part by differences in bark color and exfoliation. Rydberg (1905) relied on bark characters twice in his key to distinguish New Mexico species. In his system, *P. stramineus* is distinct from *P. microphyllus* because its old stem bark is straw-colored versus gray and a Mexican species, *P. asperifolius*, is distinguished from the rest of the species in the Microphylli group because its second year bark does not exfoliate. Hitchcock (1943) considered the former distinction to be inaccurate and described the latter distinction as "inconclusive."

Hu (1956) employed a number of stem characters and character states in his species descriptions that are not directly comparable across taxa. For several taxa, for example, Hu (1956) gives a condition for a first or second year growth character, but not for both at the same time. In other cases he referred only to qualities of the bark or branchlets without distinguishing first from second year growth. Hu's stem character states are equally confusing. For example, what is the difference between branchlets that are "fibrously striate" and those that are "longitudinally rimulose?" Is there really a difference between the "slowly exfoliating" bark of *P. argenteus* and the "closed, tardily exfoliating" bark of *P. argyrocalyx*?

The presence or absence of axillary buds was taken by Hu (1956) as one of the key characters for delimiting subgenera. In one group, the axillary buds overwinter in nodal pouches at the base of the petioles. In other groups, the axillary buds are supposedly exposed and the remaining petiole base is strongly curved away from the stem. For the New Mexican species, where *P. mearnsii* and *P. hitchcockianus* are the only species from the exposed bud type, these basic distinctions seem to hold, though not exactly as described by

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Hu. While the second groups' buds are, theoretically, exposed from the nodal pouch, in our forms at least, the bud is still enclosed by one or more protruding scales. Hu also stated that the species with enclosed buds have determinate shoots with no terminal bud and the exposed bud species have indeterminate shoots with a prominent terminal bud. I found no such difference in the New Mexico specimens. In all speeies examined, the terminal growing-point of a vegetative shoot eventually dies, leaving a short stem protruding from the previous node from which lateral growth continues in the next season; the terminus of fertile short-shoots blossom into one or more flowers.

Leaves: Hu (1956) considered the size and shape of leaves to be of minimal taxonomic importance, a conclusion supported by my study. Leaf shape and size tend to be rather variable among populations within species and to be broadly overlapping between species. Nevertheless, Hu used these eharacters several times to distinguish New Mexico taxa. *P. mearnsii*, *P. earnestii* and the pair *P. argenteus* and *P. palmeri* are all keyed in part based on leaf shape character. Furthermore one of Hu's new Mexico taxa, *P. microphyllus* var. *ovatus*, is distinguished based primarily on the characters of leaf size and shape. Hitchcock (1943) also used leaf size as an auxiliary character throughout his key and Rydberg (1905) used leaf shape to distinguish some New Mexico species. It is my belief that at least for the New Mexico forms leaf size and shape are of little taxonomic value.

Hu (1956) suggested that the nature and density of indument on the leaf surfaces are rather constant and may be used as important criteria for distinguishing species or even sections and series. Both Rydberg (1905) and Hitchcock (1943) relied strongly on leaf indument in their keys. While some aspects of leaf indumentum distinguish some of the taxa relatively well, I have found that there is also significant environmental or populational variation differences within species in these characters. This within-speeies variation may have been under-appreciated in previous treatments.

A second problem with indument involves ambiguous terminology. Hu, following Rydberg and Hitchcock, mixes various terms concerning indument texture and color and trichome shape and orientation inconsistently, such that the same character state (or set of states) is described with different terms for different taxa. Complicating this is the presence in several taxa of more than one trichome type on the same organ. These three problems concerning the character of indument have eaused some of the greatest confusion in interpreting *Philadelphus* systematics.

One other leaf character of importance is whether the two surfaces of the leaves are similar (isobilateral) or dissimilar (dorsiventral). The typical leaves of *Philadelphus* are dorsiventral, while *P. mearnsii* and *P. hitchcockianus* leaves are planar with identical surfaces and indument on both sides.

Inflorescence: I observed no significant differences in the inflorescences of New Mexico taxa despite the fact that Hu (1956) places our species in two separate inflorescence types. All taxa in New Mexico have determinate, terminal inflorescenees that contain from 1 to 3 flowers. These may be on very short shoots such that the inflorescences appear lateral, though the numerous accompanying leaves distinguishes this as a compressed shoot.

Sepals: Hu indicated that sepal characters are of little taxonomic value, however, sepals of both *P. hitchcockianus* and *P. mearnsii* are deciduous in fruit in contrast with the retained sepals of all other New Mexico taxa. Furthermore, the sepals of these two taxa are subglabrous and at most somewhat ciliate along the sepal margin, whereas species from the Microphyllus group are consistently tomentose or, more accurately, tomentulose, in a 1 to 2 mm border of the inside of the sepals. This seems to be a good distinguishing character. Other sepal characters seem to be either largely invariant or non-informative.

Corolla and petals: Hu (1956) emphasized the taxonomic importance of the appearance of the corolla and the petals in his monograph and several of the species described by Hu (1956) are distinguished by whether the corolla is cruciform, disciform or stellate. The character of corolla shape is taxonomically problematic for several reasons. First, petal shape is rarely preserved well in pressed specimens and determination of corolla shape from intact herbaria specimens requires even more guesswork. Furthermore, flowers that were known to be disciform in the field can appear for all purposes cruciform when pressed (R. Sivinski, *pers. com.*). Finally, my observations suggest that corolla shape is variable within population which are invariant with respect to all other observed characters. Thus, I disagree with Hu's emphasis of this character for taxonomic decisions. Petal characters such as the size, margin and shape are difficult to determine accurately from pressed specimens. Nevertheless, some gross differences in petal size and shape were useful in distinguishing New Mexico taxa.

Stamens: Stamen fusion and number have both been used as important key characters for New Mexico taxa. Rydberg (1905) used stamen number in his key to distinguish the large differences between *P. mearnsii* (15 stamen) and the rest of the New Mexico species (25-60 stamen) described at that point, although he did list specific stamen numbers and fusion states in the descriptions of most speeies. Hitchcock (1943) emphasized stamen number and fusion characters throughout his key, even though he explicitly recognized that "the stamens are so inconsistent in number that species cannot be distinguished in this manner." Hu considered general patterns of stamen number to be an auxiliary character to distinguish morphologically different and geographically widely separated groups of species. He did not use stamen number to key species and only used stamen fusion as a key character once.

I believe that stamen number and stamen fusion are of little use distinguishing species within the Microphylli group. When stamens number above 20, they are extremely difficult to count accurately on herbarium sheets without damaging the specimen. I am suspicious of the published stamen numbers that do not at least give a range of values. Furthermore, final stamen number in all *Philadelphus* is based on expansion from four initial stamen primordia (Andreas Winbauer, *pers. com.*). Variation in the final number is likely to reflect differences in flower size and environmental conditions and is of little primary taxonomic significance. Stamen fusion appears to be variable within plant and within population and I do not believe it is an important taxonomic character. Also, as Hu pointed out, stamen length, though variable, does not make a good character for distinguishing taxa of any rank in this group.

Pistil: Hu believed that the position of the placentas can be used as an auxiliary criterion for the delimitation of subgenera and sections of *Philadelphus*. I found the charaeter to be unreliable. Variability in the ontogenetic development of fruits on herbaria sheets leads to wide variability in the placement of the placenta and the apparent shape of the eapsule. Fusion of the stigmas is also a highly variable character and except for the distinction between the *P. mearnsii* group with entirely fused (columnar) stigmas on very

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Botany is the natural science that transmits the knowledge of plants.

(Philadelphus, Continued from page 3)

short styles and the Microphyllus group with variable fusion and longer styles, there is no information in this character for distinguishing New Mexico taxa. Hu (1956) also uses hairs on the disc and style as an important character for distinguishing most New Mexico taxa from a few others and from Mexican species, but I never saw hairs on a style. It was thus of no value distinguishing the specimens at hand in my study.

Capsule: Capsule shape and size is a difficult character to use taxonomically because of strong ontogenetic variability culminating in a destructive splitting of the capsule. The Microphylli group species have capsules that are roughly ellipsoidal at completion, although these are generally closer to obtriangular for most of their development (the portion above the insertion of the sepals appears to expand quite late in development and is present for only a short period before the capsule dehisces). The Mearnsii type capsule is more hemispheric in the portion below the sepal insertion and the subsequent expansion of the capsule above this point is not pronounced at final development.

Seeds: Hu (1956) put a surprisingly large amount of emphasis on the character of seeds, specifically the presence and length of the tail. Seeds of *Philadelphus* are minute, ontologically variable in size and character and seldom observed on undisturbed herbarium sheets. I find Hu's characters to be unreliable and extremely impractical for delimiting taxa.

In conclusion, I believe that a more accurate pattern of the taxonomic variability among the New Mexico forms of *Philadelphus* can be achieved by using a smaller set of characters than has been applied by recent monographers. By excluding variable and inconsistent characters from the analysis and by using character state terminology more consistently, one finds fewer natural discontinuities in the New Mexico forms than perceived by Rydberg, Hitchcock or Hu.

Morphological analysis

Methods: Species descriptions for potential New Mexico taxa and their key characters (Hu 1956) were converted to a single table of characters and character states (available from the author) in order to better distinguish the taxa as interpreted in this monographic treatment. Twenty-three specimens from the UNM herbarium collection were then scored for all 84 of these characters, although the character states used varied somewhat from those of Hu when his appeared synonymous or ambiguous. The scores for these specimens were used to give a better basis for new descriptions of the New Mexico taxa and to determine which characters are most useful for distinguishing New Mexico taxa in quantitative analyses. A subset of thirty-one characters were measured or scored (including derived ratios) for each of the 98 New Mexico *Philadelphus* specimens in the UNM herbarium collection. Sixteen of these characters were used in a subsequent principal components analysis of the covariance matrix for 91 specimens using Systat 5.2.1 and the varimax method.

Results and discussion: The PCA results of this analysis are not entirely sensible when the specimen identities as given on the herbarium sheets are taken at face value (Fig. 1). Two distinct clusters are separated along the first axis, the smaller consisting of specimens labeled as *P. mearnsii*, *P. wootonii*, *P. hitchcockianus*, *P. microphyllus* and *Fendlera utahensis* (hereafter the Mearnsii group). The second, more spread-out cluster, consists of specimens labeled as *P. microphyllus*, *P. argenteus*, *P. argyrocalyx*, *P. madrensis*, *P. lewisii*, *P. occidentalis*, and *P. serpyllifolius* (hereafter referred to as the Microphyllus group). Three characters, axillary bud type (exserted vs. enclosed), leaf face (isobilateral vs. dorsiventral) and inner sepal tomentosity (glabrous or ciliate vs. tomentose) are all perfectly correlated with each other and have factor loadings above 0.9 on the first axis (data not shown). They are thus the primary cause for the distinction between these two groups in this analysis.

The substructuring of the Mearnsii group along the second axis follows a strict geographical pattern, with the specimens in the larger, lower cluster all from the Guadalupe Mts. The other specimens are all from the San Andreas Mts., except for the topmost point which is from the type location for *P. mearnsii* near the southeast corner of Luna County. The highest factor loadings along the second axis are for the hypanthium and calyx indument and its density (data not shown). The Guadalupe Mts. specimens have glabrous hypanthia and sepals. All but one of the San Andreas specimens have weakly strigose hypanthia and glabrous sepals, whereas the last two specimens (one from the San Andreas and the other the *P. mearnsii* topotype) have strigose hypanthia and sepals. For the San Andreas Mt. collection, the tomentum was sparse, for the *P. mearnsii* topotype it was at normal density. The character of the hypanthium tomentum was the only trait observed in this study which differed among the 15 specimens of the Mearnsii group. The three specimens labeled as *P. wootonii*, the four labeled as *Fendlera utahensis* and the one labeled as *P. microphyllus* are clearly misidentified. If these labels were correct, the specimens would not have even one of the three character states used to distinguish the Mearnsii group in this analysis.

The lack of clear substructuring within the Microphyllus group suggests that this cluster may represent a single species. Specimens labeled as *P. microphyllus* score low for the second factor (glabrous hypanthia or sparsely strigose), *P. argenteus* specimens are in the middle portion (strigose hypanthia) and *P. argyrocalyx* score higher (densely strigose-villous or villous hypanthia). The specimen labeled as *P. lewisii* was placed squarely in the center of the *P. microphyllus* cluster. This specimen does not have the appropriate leaf or inflorescence characters to be *P. lewisii* or even to be in that subgenus. It is therefore considered to be mislabeled. Most specimens labeled as *P. occidentalis* also overlapped the main *P. microphyllus* cluster precisely. These are likely to be misidentifications as well.

The region along the second axis between the main *P. microphyllus* and *P. argenteus* clusters is filled with variously labeled specimens including a single specimen labeled *P. madrensis* and two labeled *P. serpyllifolius*. True *P. serpyllifolius* has enclosed buds and should cluster much nearer to the Mearnsii group than to the Microphyllus group. *P. madrensis*, according to its original description, should have leaves that are hispid above and spreading villose below. These character states were not observed in any of the New Mexico specimens including the one labeled as *P. madrensis*. Thus I believe then that these three specimens are misidentified. The *P. occidentalis* labeled specimens are more problematic. The original description of *P. occidentalis* fails to substantiate its distinction from a transition between *P. microphyllus* and what was later described as *P. argenteus*. Without seeing the type of *P. occidentalis* it is impossible to determine the relationship of these three taxa except to say that there is little evidence to suggest that all three exist as distinct entities in New Mexico as exemplified by the forms in this analysis.

Only 5 specimens in the UNM collection were labeled *P. argyrocalyx*, but these all clustered together toward the top of the Microphyllus group based on their densely strigose-villous or villous hypanthia and sepals. Another specimen identified only as *Philadelphus sp.* compares well with the description of *P. argyrocalyx* as do the two specimens of *P. microphyllus* and one labeled *P. argenteus* that all cluster toward the top of the Microphyllus group. All specimens labeled as *P. wootonii*, a taxon morphologically near to *P. argyrocalyx*, clustered instead in the Mearnsii group. These specimens, as suggested before, are all misidentified members of the Mearnsii group.

Fig. 2 shows the PCA results for the UNM herbarium specimens corrected for the putative misidentifications previously discussed. The Mearnsii group specimens show some geographic distinction in this analysis, but the characters involved (hypanthium and sepal indument) do not seem substantial enough to me to indicate important evolutionary

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divergence of the populations. With this in mind, I suggest that the prior name, *P. mearnsii*, be applied to all specimens in the group and that *P. hitchcockianus* be considered a taxonomic synonym. There is no evidence in the UNM collection for the existence of *P. serpyllifolius* in New Mexico and its inclusion in our flora appears to be based solely on the confusion of the type locality "between west Texas and El Paso, New Mexico."

The Microphyllus group seems to lack substantial morphological substructuring and may therefore represent a single species with variation among populations primarily in the indument of the hypanthium and calyx. There is no evidence in the UNM herbarium collection for *P. madrensis*. *P. occidentalis* may by synonymous with *P. argenteus* or with a form that is somewhat intermediate between *P. argenteus* and *P. microphyllus* with respect to the hypanthium and calyx tomentum. In either of these cases, *P. occidentalis* would have priority over the name *P. argenteus*, though not at the subspecific rank.

The morphological and geographical variation within the Microphyllus group in New Mexico can be accounted for best by division into three groups which I believe are best given status at the subspecific level. *P. microphyllus* subsp. *microphyllus* pertains to the lower end of the group which includes mostly Northern and Central New Mexican specimens with mostly glabrous hypanthia and sepals, *P. m.* subsp. *argenteus* occupies the middle of the group ineluding the Southem and Central New Mexican specimens with strigose hypanthia and sepals. The *P. microphyllus* in the Sacramento, White and Capitan mountains with particularly dense-villous (lanate) pubescence is subspecies *argyrocalyx*. There is no evidence in our collection for a distinct taxon, morphologically similar to *P. m.* subsp. *argyrocalyx*, called *P. wootonii*.

Table 1 compares several quantitative measurements for the taxa as identified in Fig. 2. There are no significant differences among taxa in the leaf and petal length/width ratios nor in the position of the sepal insertion point relative to the capsule height. Leaf and petal shape are not informative characters for the New Mexico taxa and if there are significant differences in the sepal insertion point, these differences are obscured by the sizable developmental variability in the capsule structure. Several of the measures show significant differences among at least some of the taxa with the trend in these data reflecting the general differences in size of organs (leaves, hypanthium, petals, capsules). *P. mearnsii* is the most diminutive of the New Mexican taxa followed by *P. microphyllus* subsp. *argenteus*, subsp. *microphyllus*, and finally, by the largest *Philadelphus* in New Mexico, subsp. *argyrocalyx*.

Biogeography

If one believes Hu's aceount of species distributions (Hu 1956), a number of *Philadelphus* are widespread in the U.S. southwest with overlapping distributions. *P. argenteus* and *P. occidentalis*, for example, occur in California, Baja California, Nevada, Colorado, Arizona, Mexico and Texas, oftentimes together. A number of other species appear to be sympatric such as *P. microphyllus* and *P. occidentalis*, *P. argyrocalyx* and *P. wootonii*, *P. madrensis* and *P. microphyllus* or *P. argenteus* and *P. microphyllus* and *P. argenteus*. Mearnsii group species show a similar pattern of long-disjunction and co-occurrence of species.

Hitchcock (1943) suggested a much more orderly distribution of *Philadelphus* taxa in the Southwest. In his scheme, *P. microphyllus* subsp. *argenteus* served as a basal taxon to all other taxa in this region, with the other taxa arranged in various series of morphological evolution from this center. My study supports aspects of both of their studies. Like Hitchcock, I find a much more orderly arrangement of taxa in New Mexico. *P. microphyllus* subsp. *microphyllus* has the largest range in New Mexico, covering most of the north and central portions of the state. *P. mearnsii* and *P. microphyllus* subsp. *argenteus* have smaller, mostly non-overlapping ranges in the southem end of the state. The range of subsp. *argenteus* in New Mexico is somewhat larger than indicated by Hitchcock, while the range of subsp. *argyrocalyx* is more limited. In this regard, Hu (1956) was somewhat closer to the mark, limiting *argyrocalyx* to Lincoln and Otero counties, although he did not give any New Mexico localities for *argenteus*. Hu (1956) only mapped points for *P. mearnsii* in Grant County, instead of Luna County where it should be. His point for *P. serpyllifolius* should be in Texas.

Key to the *Philadelphus* of New Mexico

1 Axillary nodes with scales, buds exposed, leaves isofacial, sepals thin and caducous in fruit, stamen fewer than 20, stigmas columnar. Plant with maple syrup odor. (Subgenus Deutzioides, section Pseudoserpyllifolius).....***P. mearnsii*** W.H. Evans ex Rydb.

1 Axillary buds in nodal pouches, buds enclosed, leaves with upper and lower surfaces different, sepals thickened and persistent in fruit, stamens > 20, stigmas at least partly divided. Plant (excluding flower) with no particular odor. (Subgenus Philadelphus, Section Microphyllus)

2 Hypanthium and sepals glabrous or with scattered trichomes at the base and/or angles.....***P. microphyllus*** Gray subsp. ***microphyllus***

2 Hypanthium and sepals uniformly pubescent

3 Hypanthium strigose, the straight hairs sparse or dense, widespread in southern part of state.....***P. microphyllus*** subsp. ***argenteus*** (Rydb.) C.L. Hitchc.

3 Hypanthium densely tomentose (lanate), hairs matted into a uniform covering with some protruding longer hairs, S. Lincoln and N. Otero Counties.....***P. microphyllus*** subsp. ***argyrocalyx*** (Woot.) C.L. Hitchc.

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(*Contined on page 6, Philadelphus*)

(*Philadelphus, Continued from page 5*)

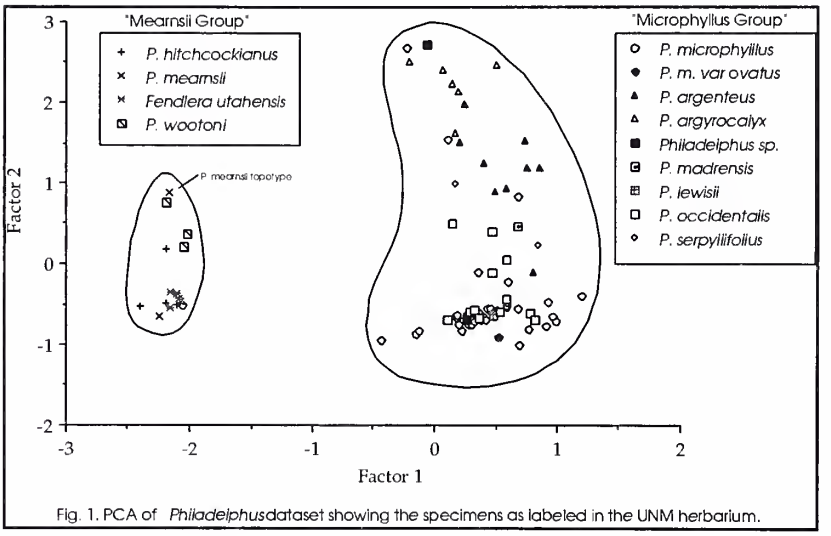

Fig. 1. PCA of *Philadelphus* dataset showing the specimens as labeled in the UNM herbarium.

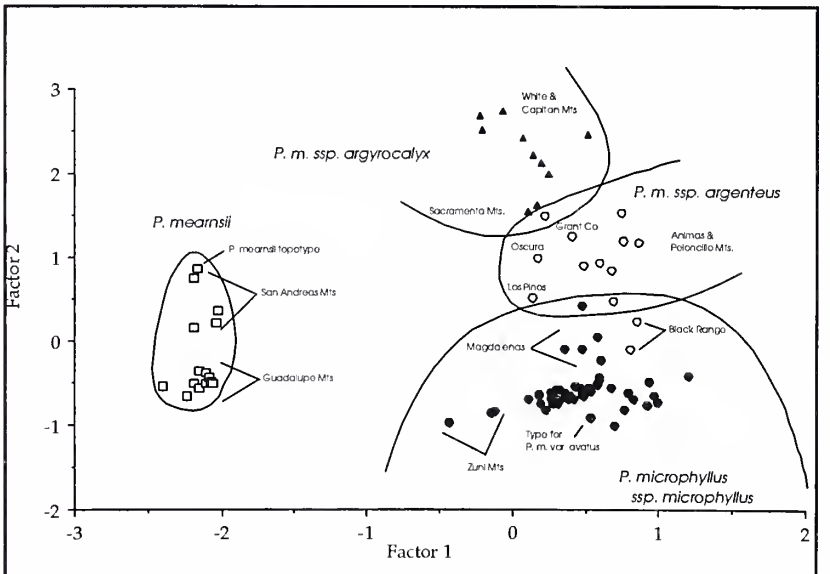

Fig. 2. PCA of Philodelphus labelled as 4 taxo; 16 chorocters, 91 specimens.

Table 1. A comparison of some of the quantitatively measured characters. Taxa with different letters are significantly different (Tukey-Kramer test, alpha = 0.05).

	P. microphyllus			
Character	argyrocalyx	microphyllus	argenteus	P. mearnsii
LeafLength/Width Ratio	2.0 ± 0.4 [a]	2.3 ± 0.4 [a]	2.2 ± 0.4 [a]	2.3 ± 0.5 [a]
LeafLength (cm)	2.1 ± 0.5 [a]	1.7 ± 0.5 [ab]	1.5 ± 0.5 [bc]	1.1 ± 0.4 [c]
LeafWidth (cm)	1.1 ± 0.1 [a]	0.8 ± 0.1 [b]	0.7 ± 0.1 [bc]	0.5 ± 0.2 [c]
Hypanthium Height (mm)	2.9 ± 0.4 [a]	2.4 ± 0.2 [a]	2.2 ± 0.4 [a]	1.3 ± 0.4 [b]
Petal Length (cm)	1.7 ± 0.2 [a]	1.1 ± 0.1 [b]	1.0 ± 0.4 [bc]	0.8 ± 0.1 [c]
Petal Width (cm)	1.2 ± 0.2 [a]	0.7 ± 0.1 [b]	0.8 ± 0.2 [ab]	0.4 ± 0.1 [c]
Petal Length/Width Ratio	1.5 ± 0.3 [a]	1.6 ± 0.1 [a]	1.4 ± 0.6 [a]	1.8 ± 0.4 [a]
Capsule Height (mm)	6.8 ± 1.2 [a]	5.9 ± 0.4 [a]	5.4 ± 0.6 [a]	3.8 ± 1.1 [b]
Sepal Position (Sepal/Caps)	0.6 ± 0.4 [a]	0.6 ± 0.4 [a]	0.6 ± 0.6 [a]	0.6 ± 0.4 [a]

New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition (herbarium) of a specimen.

— Kelly Allred (MSC Box 3-I, New Mexico State University, Las Cruces, NM.) [Most of these records were included in "A Working Index of New Mexico Vascular Plant Names" by Roalson & Allred (1995 & supplements) as specimen citations, and are compliled here to provide a citable literature report. Names marked with an asterisk (*) are reported for New Mexico for the first time.]

Apiaceae

Bowlesia incana Ruiz & Pavn: Grant Co. (NMC)
Cyclospermum leptophyllum (Pers.) Sprague ex Britt. & Wilson: Hidalgo Co. (NMC)
Spermolepis inermis (Nutt. ex DC.) Math. & Const.: Chaves Co. (NM Nat. Hist. Inst.)

Apocynaceae

Amsonia tharpii Woodson: Eddy Co. (UNM)

Asclepiadaceae

Asclepias verticillata L.: Doña Ana Co. (UNM)

Asteraceae

Brickellia parvula Gray: Luna Co. (NMC)
****Erigeron annuus*** (L.) Pers.: Lincoln Co. (UNM)
Eriophyllum lanosum Gray: Hidalgo Co. (UTEP)
Grindelia laciniata Rydb.: Sandoval Co. (UNM)
****Hieracium crepidospermum*** Fries.: Lincoln Co. (NMC)
Pectis cylindrica (Fern.) Rydb.: Doña Ana Co. (NMCR); Luna Co. (NMC)
Rayjacksonia annua (Rydb.) Hartman & Lane: Socorro Co. (NMC)
Symphyotrichum porteri (A. Gray) Nesom: Harding Co. (NMC)
Tetraneuris scaposa (DC.) Greene var. ***villosa*** (Shinners) Shinners: Eddy Co. (UNM)

Boraginaceae

Lappula echinata Gilib.: Otero Co. (NMC)
Pectocarya heterocarpa I.M. Johnston.: Luna Co. (NMC)

Brassicaceae

Brassica napus L.: Sierra Co. (NMCR)
Iberis umbellata L.: San Miguel Co. (NMC), an occasional escape
Lepidium latifolium L.: Guadalupe Co. (NMC)
Lobularia maritima (L.) Desv.: Doña Ana Co. (NMCR)
Matthiola bicornis DC.: Doña Ana Co. (NMC), an occasional escape

Buddlejaceae

Buddleja scordioides H.B.K.: Eddy Co. (NMC)

Caesalpiniaceae

****Gleditsia triacanthos*** L.: Doña Ana & Lincoln Cos. (NMCR)
Parkinsonia aculeata L.: Doña Ana Co. (NMC)

Cannabaceae

****Cannabis sativa*** L.: Otero Co. [observation] & Doña Ana Co. (NMCR)

Caryophyllaceae

Arenaria hookeri Nutt. ex Torr. & Gray: Torrance Co. (UNM)
Cerastium viscosum L.: (UNM), Catron Co. (UNM)
****Dianthus armeria*** L.: Mora Co. (NMCR) [weakly adventive]

Chenopodiaceae

Chenopodium cycloides A. Nels.: Roosevelt Co. (NMC) [addendum to report in issue 3:6]

Cuscutaceae

Cuscuta applanata Engelm.: Doña Ana Co. (NMC)
Cuscuta cuspidata Engelm.: Doña Ana Co. (NMC)

Euphorbiaceae

Euphorbia odontadenia Boiss.: Santa Fe Co. (NMC)

Fabaceae

Astragalus crassicarpus Nutt. var. ***paysonii*** (Kelso) Barneby: Colfax Co. (NMC)
Coronilla varia L.: Union Co. (NMCR)
Trifolium procumbens L.: Los Alamos Co. (UNM)

Gentianaceae

Sabatia angularis (L.) Pursh: Doña Ana Co. (NMCR), weakly adventive

Haloragaceae

Myriophyllum aquaticum (Vell.) Verdc.: Doña Ana Co. (NMCR), weakly adventive

Lythraceae

Ammannia coccinea Rottb.: Socorro Co. (R. Peterson, NM Nat. Hist. Inst.)

Nyctaginaceae

Commicarpus scandens (L.) Standl.: Grant Co. (NMC)

Onagraceae

Oenothera pallida Lindl. subsp. ***trichocalyx*** (Nutt.) Munz & Klein McKinley Co. (UNM)

Polygonaceae

Rumex pulcher L.: San Juan Co. (NMC) [addendum to earlier report in issue 7:6]

Rosaceae

****Pyrus communis*** L.: Lincoln Co. (NMCR) [persisting around old homesteads and orchards and occasionally escaping]

Rubiaceae

Diodia teres Walt. var. ***angustata*** Gray: Hidalgo Co. (NMC)

Salicaceae

Salix boothii Dorn: Sandoval Co. (Cuba Ranger Dist. Herbarium, Santa Fe Nat. For., determined by R. Dorn)

Salviniaceae

Salvinia minima Baker: Doña Ana Co. (NMCR)

Scrophulariaceae

Verbascum virgatum Stokes: Hidalgo Co. (NMC)
Veronica arvensis L.: Lincoln Co. (NMC)

Verbenaceae

Verbena tenuisecta Briq.: Doña Ana Co. (NMC)

Violaceae

Viola rafinesquii Greene: Rio Arriba Co. (NMC)

Alismataceae

Alisma subcordatum Raf.: Rio Arriba Co. (NMC)

Cyperaceae

Cyperus flavicomus Michx.: Hidalgo Co. (NMC)
Cyperus rotundus L.: Doña Ana Co. (NMCR)
Eleocharis geniculata (L.) Roemer & J.A. Schultes: Doña Ana Co. (TAES, UTEP)
Scirpus pendulus Muhl.: San Miguel Co. (UNM)

Liliaceae

Calochortus flexuosus Wats.: San Juan Co. (UNM)

Poaceae

Festuca brachyphylla J.A. Schult. ex J.A. & J.H. Schult. subsp. ***coloradensis*** Frederiksen: San Miguel Co. (NMCR)
Festuca calligera Piper: Lincoln Co. (NMCR)
Festuca earlei Rydberg: San Miguel Co. (NMCR)
Festuca trachyphylla (Hackel) Krajina: Rio Arriba Co. (NMCR)

Potamogetonaceae

Potamogeton foliosus Raf. var. ***macellus*** Fern.: Socorro Co. (NMC)

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Kelly W. Allred, Editor

Botanical Literature of Interest

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Rare, Threatened, and Endangered Plants:

[There are numerous reports and discussions concerning rare New Mexico plants on the New Mexico Rare Plant Technical Council web site: http://biology.unm.edu/~chelo/nmrptc1.html]

Journals, Newsletters, Etc.:

Native Plant Society of New Mexico Newsletter. Editor: Tim McKimmie, 1105 Circle Drive, Las Cruces, NM 88005

Oregon Flora Newsletter. Kenton Chambers, Department of Botany & Plant Pathology, Oregon State University, Cordley Hall 2028, Corvallis, OR 97331-2902 email: sundbers@bbc.orst.edu

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The New Mexico Botanist

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A Newsletter for the flora of New Mexico, from the Range Science Herbarium and Cooperative Extension Service, College of Agriculture and Home Economics, New Mexico State University.

In This Issue —

Artificial Key to the Orchids of New Mexico

Thomas Todsen
2000 Rose Lane, Las Cruces, NM 88005

1 Lip pouch- or slipper-like
2 Lip pouch-like, yellow..... ***Cypripedium parviflora*** Salib. var. ***pubescens*** (Willd.) Knight
2 Lip slipper-like, white to pink.... ***Calypso bulbosa*** (L.) Oakes var. ***americana*** (R. Brown) Luer
1 Lip otherwise
3 Plants leafless at flowering time
4 Flowers white to pink
5 Flowers few, not in a dense twisted spike; lip with cinnabar blotch ..... ***Schiedeella parasitica*** (A. Rich & Gal.) Schlt.
5 Flowers many, in a dense twisted spike; lip whitish, lacking a cinnabar blotch..... .....***Spiranthes magnicamporum*** Sheviak
4 Flowers colored otherwise
6 Flowers green..... ***Piperia unalascensis*** (Spreng.) Rydb.
6 Flowers other than green
7 Lip with 3 or more fleshy calluses; pollinia 8
8 Lip deeply 3-lobed, the sinuses 3 mm or more long .... ***Hexalectris revoluta*** Correll
8 Lip not deeply lobed, the sinuses 2 mm or less long
9 Lip less than 1 cm long.....***Hexalectris nitida*** L.O. Wms.
9 Lip more than 1.2 cm long
10 Flowers open, out-crossing..... ..... ***Hexalectris spicata*** (Walt.) Barnh. var. ***spicata***
10 Flowers closed, selfing..... ....***Hexalectris spicata*** (Walt.) Barnh. var. ***arizonica*** Catling & Engel
7 Lip with 2 or fewer calluses; pollinia 4
11 Lip 3-lobed or at least with small lobes or teeth
12 Plant small, 10-15 cm tall; lip 3-5 mm long .....***Corallorhiza trifida*** Chat.
12 Plant taller, over 15 cm tall; lip 5-9 mm long
13 Lip little expanded; bracts less than 1 mm long..... ..... ***Corallorhiza maculata*** Raf. var. ***maculata***
13 Lip distinctly expanded; bracts more than 1 mm long ....***Corallorhiza maculata*** Raf. var. ***occidentalis*** (Lindl.) Ames
11 Lip entire, without lateral lobes or teeth
14 Lip with involute margin; tepals striped..... .....***Corallorhiza striata*** Lindl. var. ***vreelandii*** (Rydb.) L.O. Wms.
14 Lip not involute; tepals not striped ..... ***Corallorhiza wisteriana*** Conrad
3 Plants with leaves at flowering time
15 Leaves basal only
16 Plants more than 20 cm tall ..... ***Goodyera oblongifolia*** Raf.
16 Plants less than 15 cm tall..... ***Goodyera repens*** (L.) R. Brown
15 Leaves cauline or appearing so
17 Leaves plicate, thin
18 Lip 3-lobed..... ***Epipactis gigantea*** Dougl.

(Continued on page 2, Orchids)

Botanice est Scientia Naturalis quae Vegetabilium cognitiorem tradit.
— Linnaeus

(Orchids, Continued from page 1)

18 Lip not 3-lobed ..... ***Epipactis helleborine*** (L.) Crantz
17 Leaves not plicate, smooth
19 Leaf one, at mid-stem
20 Flowers red-purple..... ***Malaxis porphyrea*** (Ridley) Kuntze
20 Flowers green
21 Flowers appressed to the rachis ..... ***Malaxis soulei*** L.O. Wms.
21 Flowers not appressed to the rachis ..... ***Malaxis tennis*** (Wats.) Ames
19 Leaves more than one
22 Leaves 2 at mid-stem ..... ***Listera cordata*** (L.) R. Brown var. ***nephrophylla*** (Rydb.) Hultén
22 Leaves more than 2, borne along the stem
23 Flowers white, arranged in a dense spike; lip lacking a spur..... ***Spiranthes romanzoffiana*** Cham.
23 Flowers mostly green, or if white, then arranged in a loose spike with lax flowers; lip prolonged backward into an evident spur
24 Orifice of the spur minute; base of lip with accessory nectarines.....
..... ***Coeloglossum viride*** (L.) Hartman var. ***virescens*** (Muhl. ex Willd.) Luer
24 Orifice of the spur obvious; base of lip without accessory nectaries
25 Flowers white..... ***Platanthera dilatata*** (Pursh) Lindl. ex Beck
25 Flowers green
26 Leaves short, almost bract-like..... ***Platanthera brevifolia*** (Greene) Kranzlin
26 Leaves longer, not at all bract-like
27 Column comparatively large, ½ or more the length of the dorsal sepal.....
..... ***Platanthera sparsiflora*** (Wats.) Schl.
27 Column comparatively small, less than ½ the length of the dorsal sepal
28 Lip with a small basal protuberance..... ***Platanthera limosa*** Lindl.
28 Lip without a protuberance
29 Spike densely flowered ..... ***Platanthera huronensis***
29 Spike not densely flowered
30 Spur about equal to the lip..... ***Platanthera hyperborea*** (L.) Lindl.
30 Spur about ½ or less the length of the lip ..... ***Platanthera purpurascens***

Citing Use of Herbaria

Jane Mygatt
Collection Manager, UNM Herbarium, University of New Mexico
Albuquerque, New Mexico 87131

Recently, there have been several articles in scientific journals, regional reports and newsletters written by New Mexico botanists who regularly use our local herbaria. Many authors are not citing use of herbaria in their acknowledgements. Walk-in visitors/botanists are expected to follow the same protocol and agreements as "off-site" researchers at institutions who formally borrow herbarium specimens.

In general, the agreement for using or borrowing herbarium specimens is: 1) the researcher will cite use of the collections (using the appropriate acronym) in any publication they author or presentation they give; 2) the researcher will provide the herbarium with a copy of any publication in which the specimens are mentioned.

Funding opportunities for herbaria are very competitive and smaller regional collections often are not viewed as a high priority. For the UNM Herbarium the budgetary allocations are, in part, apportioned by a show of how productive and well used the collections are. Part of this productivity is measured by documenting the research and publications of faculty, staff, research associates and the regional botanical community.

Botanists need to show support for our state-funded resources by citing use of the collections facilities or specimens in the acknowledgment section of any published article or presentation.

[Ed. Note: Thanks to Jane Mygatt for this very appropriate and timely reminder of our responsibilities as publishing authors.]

Botany is the natural science that transmits the knowledge of plants.

— Linnaeus

Botanical Literature of Interest

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Kelly Allred
Range Plant Specialist

New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition of a specimen (herbarium).

— Richard Spellenberg & Tom Wootten (see Botanical Literature of Interest: Spellenberg & Wootten 1999)

Aulocaulis leiosoleuus (Torr.) Standl. Var. ***howardii*** Spellenb. & T. Wootten (Nyctaginaceae): Otero Co. (ARIZ, NMC, UNM).

Mentzelia humilus (A. Gray) Darl. Var. ***guadalupeusis*** Spellenb. (Loasaceae): Otero Co. (NMC, UNM).

— Richard Worthington (P.O. Box 13331, El Paso, TX 79913)

Lechea tenuifolia Michx. (Cistaceae): Eddy Co. (NMCR, UTEP).

— Kelly Allred (MSC Box 3-I, New Mexico State University, Las Cruces, NM 88003)

Carex planostachya Kuntze (Cyperaceae): Eddy Co. (MICH).

— Robert Sivinski (P.O. Box 1948, Santa Fe, NM 87504)

Eriogonum longifolium Nutt. var. ***lindheimeri*** Gand. (Polygonaceae): Eddy Co. (UNM).

Physaria newberryi A. Gray var. ***yesicola*** Sivinski (Brassicaceae): Valencia & Cibola Cos. (NMC, UNM). [see also Botanical Literature of Interest, Sivinski 1999]

— Thomas Todsen (2000 Rose Lane, Las Cruces, NM 88005)

Hexalectrix revoluta Correll (Orchidaceae): Eddy Co. (photo & map on file at Guadalupe Mt. National Park Headquarters and verified by T. Todsen).

Mentzelia conspicua T.K. Todsen (Loasaceae): Rio Arriba Co. (NMC, UNM).

— Patricia Barlow-Irick (see Botanical Literature of Interest: Barlow-Irick 1999)

Cirsium ochroceutrum subsp. ***uartiuii*** P. Barlow (Asteraceae): Catron, Grant, & Hidalgo Cos. (NMC, UNM).

— Bill Hess (The Morton Arboretum, Lisle, Il 60532)

Forestiera shrevei Standl. (Oleaceae): Hidalgo Co. (NMC).

— S.L. O'Kane (see Botanical Literature of Interest: O'Kane 1999)

Lesquerella navajoensis O'Kane (Brassicaceae): McKinley Co. (NMC, UNM).

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A Newsletter for the flora of New Mexico, from the Range Science Herbarium and Cooperative Extension Service, College of Agriculture and Home Economics, New Mexico State University.

In This Issue —

Certainty and Uncertaintly in Plant Identification

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Eleetronie version of Hosking, J. R.; Sainty, G. R.; Jaeobs, S. W. L. (1996). Certainty and uneertainty in plant identifieation. Proceedings of the Eleventh Australian Weeds Conferenee, 30 September - 3 Oetober 1996, Melbourne, ed. R. C. H. Shepherd, pp. 464-467.
[Communieated to The New Mexieo Botanist by Tim Lowrey, UNM.]

Summary Many plant specimens are not identified correctly or many of the names used for them are not applied correctly. There is a need for plant identifications to be checked by specialists and specimens to be stored for future reference. This is particularly important for survey data and the only adequate long term storage appears to be in herbaria. Identifications are made in the light of current taxonomic knowledge and this is constantly being revised. Without access to the original specimens, results of previous surveys and research may not be of much use. Voucher specimens should therefore be a requirement for all plant research and this also applies to all weed research. Problems associated with use of data-based collections and long term storage of specimens, particularly the expense of maintaining collections, are discussed.

INTRODUCTION

Even for those species that we now regard as being nomenclaturally stable or biologically well known, we have no idea what the future may bring in regards to new information and subsequent improvement in our biological understanding. These principles apply to weed species possibly more than any other. Weeds are often first recorded as a problem in the field, passed on in the form of an inadequate specimen to an identification authority, with little or no idea of their origin. They are frequently either identified with species that have proven troublesome elsewhere or identified from inappropriate publications from wrong geographical areas.

For species that have had a simple change of name there is not much problem. The synonymy can be quite straightforward and easily transferable. Where there has been a misidentification, at whatever level, or our knowledge has changed such that we now recognise two or more species in what was formerly one species (a good example is the 10 species and a number of hybrids of blackberry that were formerly all called *Rubus fruticosus*) then it can be very difficult, if not impossible to track down what was the species actually being referred to.

Collecting and lodging relevant voucher specimens in recognised herbaria is the only process that allows the biological integrity of any particular survey or study to be checked or updated. We present examples below of some of the commonly confused species and some examples where confusion has clouded the literature, we discuss the processes involved in storing and maintaining the specimens and some of the techniques or information sources that can be misused. Species names used here are as in Harden (1990–1993) except where that species is not covered, and then the authority is given.

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Botanice est Scientia Naturalis quae Vegetabilium cognitiorem tradit.
— Linnaeus

(Plant Id, Continued from page 1)

CONFUSION

There are many species that have been confused in the past and at present. Some examples of weed species commonly confused are given in Table 1.

Table 1. Weed species commonly confused and often incorrectly identified

Family	Genus	Species
Asteraceae	*Aster*	*subulatus*
	Conyza	spp.
	Erigeron	spp.
	Bidens	spp.
	Carduus	*tenuiflorus*
	Carduus	*pycnocephalus*
	Cassinia	*laevis*
	Cassinia	*quinquefaria*
	Centaurea	*melitensis*
	Centaurea	*solstitialis*
	Euchiton	spp. (prev. part of *Gnaphalium*)
	Gamochaeta	spp. (prev. part of *Gnaphalium*)
	Gnaphalium	spp.
	Hypochaeris	*glabra*
	Hypochaeris	*radicata*
	Onopordum	*acanthium*
	Onopordum	*illyricum*
	Senecio	*lautus* subspecies
	Senecio	*madagascariensis*
	Xanthium	*cavanillesii*
	Xanthium	*italicum*
	Xanthium	*occidentale*
	Xanthium	*orientale*
Caryophyllaceae	*Arenaria*	*leptoclados*
	Stellaria	*media*
	Stellaria	*pallida*
	Cerastium	spp.
Convolvulaceae	*Cuscuta*	spp.
Cyperaceae	*Cyperus*	*bifax*
	Cyperus	*rotundatus*
	Cyperus	*victoriensis*
Euphorbiaceae	*Chamaesyce*	spp.
Fabaceae		
(Faboideae)	*Cytisus*	*scoparius*
	Genista (or *Teline*)	*monspessulana*
	Genista (or *Teline*)	*stenopetala*
	Vicia	spp.
(Mimosoideae)	*Prosopis*	spp.
Fumariaceae	*Fumaria*	spp.
Iridaceae	*Homeria*	spp.
	Watsonia	spp.
Juncaceae	*Juncus*	spp.
Malaceae	*Cotoneaster*	spp.
	Crataegus	spp.
	Pyracantha	spp.
Oleaceae	*Ligustrum*	*sinense*
	Ligustrum	*vulgare*
Oxalidaceae	*Oxalis*	*chnöodes*
	Oxalis	*corniculatus*
	Oxalis	*exilis*
	Oxalis	*perennans*
	Oxalis	*radicans*
	Oxalis	*rubens*
	Oxalis	sp. A
Papaveraceae	*Argemone*	*mexicana*
	Argemone	*ochroleuca*
	Argemone	*subfusiformis*
Poaceae	*Avena*	spp.
	Digitaria	*ciliaris*
	Digitaria	*sanguinalis*
	Echinochloa	spp.
	Eragrostis	spp.
	Panicum	spp.
	Phalaris	spp.
	Vulpia	spp.
Polygonaceae	*Persicaria*	spp.
	Polygonum	*arenastrum*
	Polygonum	*aviculare*
	Rumex	spp.
Rosaceae	*Rubus*	*'fruticosus'*
	Rubus	*chloocladus*
	Rubus	*discolor* [=*R. procerus*]
	Rubus	*leightonii*
	Rubus	*polyanthemus*
	Rubus	*pyramidalis*
	Rubus	*radula*
	Rubus	*rosaceus*
	Rubus	*selmeri*
	Rubus	*ulmifolius*
	Rubus	*ulmifolius* hybrids
	Rubus	*vestitus*
Salicaceae	*Salix*	spp.
Scrophulariaceae	*Orobanche*	spp.
	Striga	spp.
Solanaceae	*Physalis*	spp.
	Solanum	*elaegnifolium*
	Solanum	*esuriale*
Thymelaeaceae	*Pimelea*	spp.
Typhaceae	*Typha*	spp.
Verbenaceae	*Phyla*	spp.
	Stachytarpheta	spp.
	Verbena	*bonariensis*
	Verbena	*incompta* P.W. Michael
	Verbena	*caracasana* Kunth
	Verbena	*litoralis*
	Verbena	*officinalis*
	Verbena	*quadrangularis* Vell. (= *brasiliensis* misapplied)
Zygophyllaceae	*Tribulus*	*micrococcus*
	Tribulus	*minutus*
	Tribulus	*terrestris* (introduced)
	Tribulus	*terrestris* (native)

In some cases confusion occurs between families, for example between *Cuscuta* spp. (Convolvulaceae) and *Cassytha* spp. (Lauraceae or Cassythaceae). It is also interesting to note that due to difficulty in identifying species of *Cuscuta*, all species in this genus have been declared noxious in many States of Australia (Parsons and Cuthbertson 1992). Native *Cuscuta* spp. are not considered to be a problem whereas *C. campestris* is considered to be a major problem (Parsons and Cuthbertson 1992). There are still a number of examples where species limits still need to be defined, for example at least two distinct entities are covered by the name *Tribulus terrestris* in Australia (Morrison and Scott 1993).

Misidentifications have resulted in delays to control programs for various weeds. This occurred in South Australia where *Solanum elaeagnifolium* was collected by J. M. Black in 1918

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but it was believed to be *Solanum esuriale* at the time. In 1947 Black sent specimens to Kew and they were identified as *S. elaeagnifolium* (R. Carter personal communication). Co-ordinated control did not start until 1958 when the South Australian Department of Agriculture started to refer to the species as introduced (R. Carter personal communication).

Rapid spread of weeds may also occur through misidentifications. A recent example is the rapid distribution of alligator weed, *Alternanthera philoxeroides*, by the Sri Lankan community in Australia. The species was distributed in the mistaken belief that it was the vegetable, mukunawanna, *Alternanthera sessilis* (J. Dellow and R. Carter personal communications).

Herbaria The only way to minimise the problems of misidentifications or subsequent classification changes is to collect voucher specimens and to lodged them in a herbarium where there is some chance of the collections being maintained in the long term.

It is difficult for generalist Identification Officers, who are not specialists in any particular group, to correctly identify large numbers of specimens accurately. Such Officers deal with large numbers of enquiries for little or no charge, and are often very skilled. Mind reading, however, is not one of their skills and if you have some critical voucher specimens that should be retained then this information needs to be communicated. Most herbaria will not retain poor quality collections for any reason. If you have a research project where the lodging of voucher specimens is relevant, then you should arrange for the collaboration of an appropriate specialist beforehand. These days this often means including funds for identification.

There is also a cost associated with storage of plant specimens and this needs to be recognised. This cost should particularly be built into projects where many specimens will be collected and stored for future reference. The need for constant curation of collections is also necessary as anyone who has looked at specimens in herbaria will realise. It is difficult for Identification Officers who are not specialists in particular groups to be able to give the correct identification when a number of distinct species are included under the same name in collections. This is a common occurrence in herbaria and results in a number of misidentifications, but it is also how progress is made in understanding the group. The need to constantly update names and identifications in the light of current taxonomic knowledge and to increase funding to maintain collections cannot be overemphasised.

Collection of specimens There is a need for high quality plant specimens to be lodged in herbaria. In most cases this will mean flowering and fruiting sections of plants and in some cases other parts such as roots and bulbs. In some cases it is also desirable for collection of vegetative stages. This is particularly important for identification of forms of *Chondrilla juncea* (R. Groves personal communication). In this case natural enemies such as the rust fungus, *Puccinia chondrillina* Bubak & Syd., and the chondrilla gall mite, *Aceria chondrillae* (Canestrini) show specificity to particular forms of *C. juncea* (Groves and Cullen 1981).

Databases are no substitute for looking at the specimens Databasing of collections is increasing around Australia and this is desirable but it is no substitute for checking the specimens. Plants have often been misidentified, details from the collection typed in incorrectly and the location vague (could be applied to many areas). If using databases at least check outlying locations as these are most likely to be incorrect. It also pays to check whether there have been any problems with the database. This may mean that changes have been made in the collection but do not appear on the database.

Use of voucher specimens Voucher specimens can be used to check previous identifications in the light of current taxonomic knowledge. For example the photograph of *Verbena bonariensis* in Auld and Medd (1987) was redetermined as *Verbena incompta* (Michael 1995) because voucher specimens were lodged at the NSW Herbarium.

Many species are not sent to herbaria for identification because people think that they know the species they are dealing with. This was the case with *Chromolaena odorata* (L.) R. M. King & H. Robinson, from the Tully area, which locals called giant billy goat weed in the mistaken belief that the species was a large form of *Ageratum conyzoides.*

Many plant surveys, including weed surveys, have been published in the past where voucher specimens have not been lodged in a herbarium. We often have difficulty in believing some of the names on lists but there is no way to check the accuracy. Without specimens many of these records have to be disregarded. Good voucher specimens take time to collect but are essential. No survey should be published without vouchers being lodged in a designated herbarium.

Some plant books have excellent voucher specimens for the species photographed. For example Cunningham *et al.* (1981) and Auld and Medd (1987). A number of lists of plant species for various areas also have large numbers of voucher specimens lodged at various herbaria, for example McBarron (1955), Williams (1979) and Hosking (1990).

Misuse of voucher specimens It is essential that the policy of a herbarium with regard to specimens is understood. In some cases the number of specimens collected over time has been used to indicate whether a weed problem is increasing or decreasing. This is of little use if a herbarium considers that they have plenty of specimens for a particular area of the State and no longer retain additional collections. Most specimens sent in for identification are not retained by herbaria. Presence or absence of a species from an area based on herbarium specimens is also fraught with danger. So-called well known species are often rarely sent in for identification resulting in absence of specimens from various locations.

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Importance of correct identifications In a number of cases the correct plant identification, and an understanding of its taxonomy and biogeography are important. These are particularly important for biological control programs. For example:

1. Various strains of the blackberry rust, *Phragmidium violaceum*, are likely to be more effective than others on different introduced *Rubus* spp. in Australia (Bruzzese and Hasan 1986, Bruzzese 1995).

2. The seed-feeding weevil, *Erytenna consputa* Pascoe, used to control *Hakea sericea* in South Africa was collected from Wilson's Promitory Peninsula in the mistaken belief that this was the same plant as the one causing the problem in South Africa (Kluge and Neser 1991). Recent taxonomic study has shown that the plant from Wilson's Promitory is *Hakea decurrens* R. Br. (Barker 1996). Populations of this weevil collected from *H. sericea* from south-eastern New South Wales, from the correct plant taxon, have successfully established on this plant in South Africa.

3. Early attempts to control this *Salvinia molesta* were not successful because the weevil, *Cyrtobagous singularis* Hustache was collected from *Salvinia auriculata* Aubl. in the mistaken belief that the plant species were the same (Room 1986). Salvinia weevil, *Cyrtobagous salviniae* Calder & Sands, collected from *Salvinia molesta* now successfully controls this water fern in many areas around the world.

Correct identifications may also be important for chemical control of weeds. For example various *Fumaria* spp. appear to have different susceptibilities to herbicides (McQuinn 1990). Another example is where irrigation managers at Emerald in the 1970s noted that *Vallisneria gigantea* was not being controlled by the accepted concentration of acrolein (C. Julian personal communication). An investigation concluded that the 'form' of *Vallisneria* present in the Emerald channels had a thicker than usual leaf and required a higher dose rate. This 'form' has been known as *Vallisneria spiralis* var. *denseserrulata* Makino.

CONCLUSION

Collect voucher specimens and others will know with certainty the species being referred to. Do not collect vouchers and you may as well not publish your results.

ACKNOWLEDGMENTS

We would like to thank Bill Barker for information on *Hakea* species in Australia. Suggestions and comments received from Richard Carter, Jim Dellow, Richard Groves, Rick Roush and Andy Sheppard have been noted and their assistance is acknowledged.

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Botany is the natural science that transmits the knowledge of plants.

— Linnaeus

Notes on *Sparganium emersum* and *S. angustifolium*

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There is some confusion regarding two closely related species of *Sparganium*: *Sparganium emersum* Rehmann and *S. angustifolium* Michx. Kartesz (1994) considers *S. emersum* and *S. multipedunculatum* (Morong) Rydb. As synonyms of *S. angustifolium*. Martin and Hutchins (1980) does not include *S. emersum*, listing only *S. multipedunculatum* as a synonym of *S. angustifolium*. Correll and Correll (1972) recognize both *S. angustifolium* and *S. emersum*, stating that the North American variety of *S. emersum* is var. *multipedunculatum*, and indicate that New Mexico is part of the range of *S. emersum*. They eall attention to the similarity of these species: "It is quite possible that this concept [*S. angustifolium*] should be united with *S. emersum*. Their separation, based primarily on size differences, is most tenuous."

Some recent floras, however, all recognize *Sparganium angustifolium* and *S. emersum* as two separate species (Hickman 1993; Weber & Wittmann 1996; Welsh et al. 1993).

Finally, my experience supports the proposition that *Sparganium angustifolium* and *S. emersum* are two separate species. I have colleet *S. angustifolium* from a population in a pond at the base of the eastern slope of the Brazos Ridge (10,600 ft) and at two other ponds in the Lagunitas Lakes area (10,400 ft). The leaves are narrow and thin and float on top of the water. Only the inflorescences stick above the water.

In contrast, I have seen *Sparganium emersum* (growing without *S. angustifolium*) in ponds near Canjilon Creek (9300 ft) and also at Trout Lakes (9300 ft). These plants have very rigid, thick stems and leaves that project vertically above the water. This feature is charaeteristic of all the plants in the population. Similarly, the weak, narrow, floating leaves of *S. angustifolium* are characteristic of all the plants in their populations.

On the basis of the above observations, I propose that *Sparganium emersum* be considered a separate species from *S. angustifolium*, and be added to the list of New Mexico plants.

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On *Dalea compacta* in New Mexico

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1750 Camino Corrales, Santa Fe, NM 87505

Dalea compacta Sprengel vars. *compacta* and *pubescens* (A. Gray) Barneby, as well as *D. cylindriceps* Barneby, are listed for New Mexico in the current draft of "A Working Index of New Mexico Vascular Plant Names" (Allred, ed., 1999). There's a mix-up.

Petalostemon macrostachyum Torrey is (or was) a species extending from South Dakota and Wyoming south to New Mexico. Torrey and Gray in 1840 opined that it might be the same as *D. compacta*, a species of southeastern Oklahoma and adjacent areas. Wooton and Standley (1915, Flora of New Mexico) and others accepted that speculation as fact. But according to Barneby (1977, N.Y. Bot. Gard. Memoirs 27: 227 and 268-270) the two species do not occur close to one another and are different; he separates them at Step 4 on p. 223. Also, the corollas of *D. cylindriceps* are ochroleucous to pink, those of *D. compacta* red-purple to rose. To put the species in *Dalea*, Barneby provides a new name (*D. cylindriceps*), since there was already a *D. macrostachya*. The species is widespread in the eastern half of New Mexico. C. Keller, G. Cox, and I collected it in White Rock Canyon 10 July 1999, adding Los Alamos County to its distribution.

Dalea compacta var. *compacta* has not been reported for New Mexico except on the out-of-date assumption that it is the correct name for *P. macrostachyum*.

Dalea compacta var. *pubescens*, which includes *D. helleri* Shinners (and its obligate synonym *Petalostemon pulcherrimum* A. Heller), occurs in Oklahoma and eastern Texas west to Amarillo. Barneby thinks that Wemple's records (1970, Iowa State Jour. Sci. 45: 1-102) of it in Trans-Pecos Texas and the Rio Grande valley are perhaps from introductions or misidentifications. Isely's map (1998, Native and Naturalized Leguminosae p. 507) does show it in Torrance County, New Mexico, although his text has "Se and c TX (-s OK, -nw LA)."

I believe that *Dalea compacta* should be omitted from the New Mexico flora until a definite specimen is located.

Botanical Literature of Interest

TAXONOMY AND FLORISTICS:

Dorn, R.D. 2000. **A taxonomic study of *Salix* sections *Mexicanae* and *Viminella* subsection *Sitchenses* (Salicaceae) in North America.** Brittonia 52(1):1-19.

Flora of North America Editorial Committee. 2000. **Flora of North America, vol. 22.** Oxford Univ. Press. 352 pp. [Butomales, Hydrocharitales, Najadales, Arecales, Arales, Commelinales, Eriocaulales, Juncales, Typhales, Bromeliales, Zingiberales]

MacDonald, S.O. 2000. **Common Grasses of Grant and Catron Counties, New Mexico.** Upper Gila Watershed Alliance. 63 pp.

Toolin, L. & J.R. Reeder. 2000. **The status of *Setaria macrostachya* and its relationship to *S. vulpiseta* (Gramineae).** Syst. Bot. 25(1):26-32.

Vitt, D.H. 2000. **The classification of mosses: Two-hundred years after Hedwig.** Nova Hedwigia 70(1-2):25-36.

Worthington, R.D. 1999. **Inventory of the flora of the New Mexico portion of the Guadalupe Mountains, Otero and Eddy Counties, New Mexico.** [working first draft, available from the author]

MISCELLANEOUS:

Dorr, L.J. 2000. **Joseph Andorfer Ewan (1909-1999).** Taxon 49(1):107-112.

Ryckman, R.E. & J.L. Zackrison. 1998. **Son of the Living Desert: Edmund C. Jaeger.** Publ. by senior author, 25877 Chula Vista St., Redlands, CA 92373.

Weber, W.A. 2000. **The American Cockerell: A Naturalist's Life, 1866-1948.** University Press of Colorado, Boulder. 352 pp.

RARE, THREATENED, AND ENDANGERED PLANTS:

[See New Mexico Rare Plants, presented by the NM Rare Plant Technical Council: http://nmrareplants.unm.edu]

WEB SITES OF INTEREST:

Photo Gallery of flora of the Corona Ranch, New Mexico State University, Lincoln/Torrance Cos.: http://web.nmsu.edu/~kallred/corona/ka_plants.htm

Topographic maps for the entire United States available for free: http:..www.topozone.com

Location of herbaria in the 48 contiguous states of the U.S. and the southern provinces of Canada are mapped at http://biology.usu.edu/herbarium/herbne.htm

Locate places, geographic features, counties, etc. at the Geographic Names Information System hosted by USGS: http://mapping.usgs.gov/www/gnis/

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Native Plant Society of New Mexico
Sep 29-Oct 1, 2000
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- Landscape Processes and the Recovery of Desert Grasslands by Debra Peters
- The Chihuahuan Desert Nature Park: K-12 Environmental Science Education on the US-Mexico Border by Stephanie Bestelmeyer
- Integrating Land Cover Mapping, Animal Distribution Prediction, and Stewardship Analysis for Conservation Planning in the Southwestern Landscape by Bruce C. Thompson
- New Mexico's First Botanist: TDA Cockerell by Carolyn Dodson and David L. Bleakly
- SWEC proposes Mesilla Valley Bosque Park by Beth Bardwell
- Birds of the Chihuahuan Desert by Mary Alice Root and Dale and Marian Zimmerman
- National Park Service's new Chihuahuan Desert/Southern Shortgrass Prairie Exotic Plant Management Team by Renée West
- The Vascular Flora of White Sands Missile Range by David Lee Anderson
- Endangered Desert Diversity by Laura Foster Huenneke
- Computer-aided Residential Landscape Design by Rolston St. Hilaire

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Contact: NPS/NM Annual Meeting 2000
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5259 Singer Road
Las Cruces, NM 88005
lisamand@zianet.com
(505) 526-0917

New Plant Distribution Records

New records for New Mexico are documented by the county of occurrence and the disposition of a specimen (herbarium).

— James McGrath [P.O. Box 2605, Tijeras, NM 87059]

Antennaria corymbosa Nelson (Asteraceae): Rio Arriba Co. (UNM).

Carex geyeri Boott (Cyperaceae): Rio Arriba Co. (MICH, UNM).

Carex jonesii Bailey (Cyperaceae): Rio Arriba Co. (MICH, UNM).

Potamogeton alpinus Balbis (Potamogetonaceae): Rio Arriba Co., Lagunitas Lakes wetland complex (UNM).

Lemna turionifera Landolt (Lemnaceae): Rio Arriba Co., pond near Canjilon Creek (UNM).

— Kelly Allred [MSC Box 3-I, New Mexico State University, Las Cruces, NM 88003] & Ken Heil [San Juan College, Farmington, NM 87402]

Stipa arida Jones (Gramineae): San Juan Co., Navajo Nation, about 1.5 miles south of Beclabito on Beclabito Dome, near top of dome, Wingate formation, desert scrub community, T30N R21W, 5800 ft, 26 May 1995, K. Heil 8885 (SJC).

Stipa speciosa Trin. & Rupr. (Gramineae): San Juan Co., Ute Mountain Indian Reservation, Cottonwood Canyon, T31N R15W Sec 5, 24 June 1985, M. Porter 1421 (SJC). This species was reported by Wooton & Standley (Flora of New Mexico), who cited Standley 7515 from the Carrizo Mts. in northwestern San Juan County, but this specimen has not been located. Martin & Hutchins (A Flora of New Mexico) also listed the species. No specimens validating these reports have been found until now.

— Kelly Allred [MSC Box 3-I, New Mexico State University, Las Cruces, NM 88003]

Ciclospermum leptophyllum (Pers.) Britton & E. Wilson (Apiaceae): Lea Co. (NMCR). This is the second occurrence in New Mexico for this cosmopolitan weed (previous report from Hidalgo Co.).

— George W. Cox [13 Vuelta Maria, Santa Fe, NM 87501] & Roger S. Peterson [1750 Camino Corrales, Santa Fe, NM 87505; NMNHI is at the Randall Davey Audubon Center, Santa Fe.]

Hesperis matronalis L. (Brassicaceae): San Miguel Co. (NMC, NMNHI).

— Roger S. Peterson [1750 Camino Corrales, Santa Fe, NM 87505; NMNHI is at the Randall Davey Audubon Center, Santa Fe.]

Agalinus calycina Pennell (Scrophulariaceae): Chaves Co. (NMC, NMNHI, Bitter Lake N.W.R.)

Campanula rapunculoides L. (Campanulaceae): Colfax Co. (NMC, NMNHI); documents with a specimen the records of Atlas of the Flora of the Great Plains from Colfax, Taos, and Santa Fe counties.

Carex angustior L. (or included in *C. muricata* L.) (Cyperaceae): Santa Fe Co. (NMC). Collected by I. L. David.

Carex sprengelii Dewey (Cyperaceae): Colfax Co. (NMNHI). Determined by A. Reznicek, University of Michigan.

Carum carvi L. (Apiaceae): Colfax Co. (NMC, NMNHI).

Cuscuta warneri Yuncker (Cuscutaceae): Sierra Co. (NMC, NMNHI).

Cymopterus purpurascens (Gray) Jones (Apiaceae): San Juan Co. (NMNHI); documents with a specimen the report of Welsh et al. 1993, A Utah Flora.

Draba spectabilis Greene (Brassicaceae): Santa Fe Co. (collected by D. C. Lowrie in 1984), Mora Co. (NMC, NMNHI).

Hypericum perforatum L. (Clusiaceae): Colfax Co. (NMC, NMNHI). Recorded also from Mora Co. (L. La Grange, N. M. Highlands University).

Lonicera* x *bella Zabel (Caprifoliaceae): Santa Fe Co. (NMC, NMNHI).

Lupinus argenteus Pursh var. ***argentatus*** (Rydb.) Barneby (Fabaceae): Colfax Co. (NMNHI); documents with a specimen the report of Barneby (1989), Intermountain Flora, vol. 3, pt. B.

Osmorrhiza longistylis (Torrey) DC. (Apiaceae): Colfax Co. (NMC, NMNHI).

Saccharum ravennae (L.) Murray (Poaceae): Chaves Co. reported by G. Warrick, determined by K. Allred (NMC, NMNHI, Bitter Lake N.W.R.).

Silene latifolia Poir. subsp. ***alba*** (Miller) Greuter & Burdet (= *Lychnis alba* Miller) (Caryophyllaceae): Colfax, San Miguel counties (NMC, NMNHI).

Stanleya viridiflora Nutt. ex Torr. & Gray (Brassicaceae): Sandoval Co. (NMNHI); San Juan Co. collected by H. L. Cannon in 1962 (NMC).

Taraxacum scopulorum (A. Gray) Rydb. (Asteraceae): Mora Co. (NMC, NMNHI).

Vitex agnus-castus L. (Verbenaceae): Socorro Co. (NMC, NMNHI). Reported for N. M. by Britton and Brown in 1913.

— Richard Worthington [P.O. Box 13331, El Paso, TX 79913]

Acer grandidentatum Nutt. var. ***sinuosum*** (Rehder) Little (Aceraceae): Hidalgo Co. (UNM); Eddy Co. (UNM)

Oenothera triloba Nutt. (Onagraceae): Eddy Co. (TTC)

Packera obovata (Muhl. ex Willd.) W.A. Weber & A. Löve (Asteraceae): Eddy Co. (BRIT, UTEP)

— McArthur & Sanderson, 1999 [see Botanical Literature of Interest]

Artemisia tridentata Nutt. subsp. ***wyomingensis*** Beetle & Young (Asteraceae): Taos Co. (SSLP)

— Brady Allred [2015 Jordan Road, Las Cruces, NM 88001]

Ligustrum vulgare L. (Oleaceae): San Miguel Co., South San Ysidro, northeast banks of Pecos River at junction with county road B43B, N35°26'48.8" W105°34'52.9", 10.5 air miles southeast of Pecos; 27 June 2000, B. Allred 164 (NMCR). There were several plants persisting on both sides of the river, presumably as escapes from cultivation.

— Bill Hess [The Morton Arboretum, Lisle, IL 60532]

Spiranthes parasitica A. Rich. & Gal. (Orchidaceae): Grant Co: Black Range, Wright Cabin campground (WNMU).

— Carson National Forest, Forest Service, USDA [208 Cruz Alta Road, Taos, NM 87571], in an April 2000 "scoping document" on invasive weeds:

Carduus acanthoides L. (Asteraceae): Rio Arriba & Taos Cos.

Vernonia noveboracensis (L.) Michx. (Asteraceae): Rio Arriba Co.

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A Newsletter for the flora of New Mexico, from the Range Science Herbarium and Cooperative Extension Service, College of Agriculture and Home Economics, New Mexico State University.

In This Issue —

The Botanical Brandegees and their Eponyms

Christopher K. Frazier
NM Natural Heritage Program, Dept. of Biology, University of New Mexico, Albuquerque, NM 87131
&
Kelly W. Allred
Range Science Herbarium, Dept. of Animal & Range Sciences, New Mexico State University, Las Cruces, NM 88003

The flora of New Mexico includes several taxa with epithets honoring the botanists Townshend Stith Brandegee (1843–1925, herein referred to as TS) or his wife, Mary Katharine (Layne) (Curran) Brandegee (1844–1920, herein referred to as Kate). Most of these have traditionally used the eponym "brandegei," but recommendation 60C.3 of the 1994 International Code of Botanical Nomenclature states that "In forming new epithets based on personal names, the original spelling of the personal name should not be modified unless it contains letters foreign to Latin plant names or diacritical signs." In accordance with this, for A Working Index to New Mexico Vascular Plant Names (Allred 2000) all of these epithets have been changed to "brandegeei."

In the course of reviewing these changes, we were surprised by the extent of botanical work completed by the Brandegees and the degree to which they were honored with eponyms. There are 9 eponyms currently in the flora of New Mexico honoring one or the other of them (it is unclear which, except for *Elodea brandegeeae*, where the feminine ending celebrates Kate) and another four eponymous types that are synonymous with New Mexico taxa (Table 1). Outside of New Mexico, there are an additional 111 species names with the epithet "brandegeei," or the combination of their name with a non-standard ending such as –ana, -anum, -ae, -ea, or –a. An additional 17 eponyms were published at the subspecific rank. There is one genus commemorating TS, the monotypic *Brandegea* in the Cucurbitaceae. The eponyms do not end there, however, since Kate had been an active botanist prior to her marriage (her second, at age 45) to TS. There are 67 eponyms honoring her as Kate Curran and another 7 based on "Layne" (2 at subspecific rank), her maiden name.

TS Brandegee is the author of 5 New Mexico taxa (Table 2). Outside of New Mexico, however, it becomes a much more laborious effort to determine which of the Brandegees described a given taxon. The authority abbreviation "Brandegee" is reserved for TS and "K. Brandegee" for Kate (Brummitt and Powell 1992); however, in practice "Brandegee" is often used to refer to either. In any case, 18 genera were described by the Brandegees (across 12 families) and 957 species or subspecific taxa (881 retrieved as Brandegee, 43 as K. Brandegee, 33 as Curran, all data from The Plant Names Project 1999). As far as we can tell, there are no taxa described by both (e.g. Brandegee et K. Brandegee), even though there are several groups worked on by both. For example, *Astragalus haydenianus* A. Gray ex Brandegee was collected by TS from SW Colorado, *A. brandegeei* Porter & J. M. Coult., from Colorado, was named after TS and *A. coccineus* from California was described by TS. On the other hand, *Astragalus layneae* Greene and *Astragalus malacus* var. *layneae* Jones were named for Kate. Among the monkeyflowers, *Mimulus layneae* was named for Kate, *M. brandegeei* for TS (Crosswhite and

(Continued on page 2, Brandegees)

Botanice est Scientia Naturalis quae Vegetabilium cognitiorem tradit.
— Linnaeus

(Brandegees, Continued from page 1)
Crosswhite 1985). Four other species (*M.androsaceus, M. nudatus, M. pictus*, and *M. kelloggii*) were described by Kate under the authority "Curran" and one species, *M. clevelandii*, was described by TS.

Townshend Stith Brandegee had a remarkable career first as a collector and later, under the influence of Kate, as a taxonomist and more general plant scientist. Though his training was in civil engineering, he studied botany with D.C. Eaton while at Yale. He became county surveyor and city engineer in Cañon City, Colorado in 1871, and while there collected ferns for John H. Redfield (Elliott 1979). Other unknown plants he sent to Asa Gray of Harvard (both Gray and Sir Joseph Hooker visited Brandegee in Cañon City in 1877). In 1875, Gray recommended TS as a botanical collector for Ferdinand V. Hayden's exploring expedition in SW Colorado and adjacent Utah. He subsequently served as engineer for various railway surveys in the west including at least some work in New Mexico and a posting in Santa Fe (Setchell 1925, Slack 2000b). All the while he was botanizing. Asa Gray described *Galium brandegeei* in 1877 from material collected by TS in the "Valley of the Rio Grande, on the Los Pinos Trail" (there is a Los Pinos trail near the Puerco between Rio Arriba and Sandoval Counties, 13 km N of Cuba, however, it is more likely the collection is from near the town of Los Pinos in the far north of Rio Arriba county near the Colorado border where there is also the C&T scenic railway).

TS collected logs of wood of trees for Charles Sprague Sargent's "Report on the Forests of North America" as a side job. He published "The Flora of Southwestern Colorado" in 1876 and was singled out in the preface to the first full flora of Colorado (Porter and Coulter 1874) for "his large and fine collections from the southern part of the territory." After leaving railway work, TS mapped the forests of the Adirondacks in New York state and then worked two years as a forest surveyor and botanical collector in the Cascade Mountains of Washington. In 1886 and 1887 he again collected tree trunks for Sargent , visiting Montana, Nevada and California among other states. Asked to collect logs of two species from Santa Cruz Island, TS took the opportunity to make "a complete collection of the plants of the island and also of those of Santa Rosa Island. California became my home state then and botany alone my study and work" (Setchell 1926). He settled in San Francisco, California, and began a study of the islands off the coast of California and Baja California. Beginning in 1889, he made many expeditions into Baja California and other regions of Mexico, becoming one of the earliest plant explorers and collectors in these regions (Slack 2000b). In San Francisco, TS became a member of the California Academy of Sciences and came into the scientific circle of such men as H.W. Harkness, Albert Kellogg, E.L. Greene and Mary Katharine Curran. After his first trip to Baja, California in 1889, he married Kate in San Diego. For the honeymoon, they walked back to San Francisco, botanizing all the way.

At age 22, Kate, a school teacher, married an alcoholic constable, Hugh Curran. When he died in 1874 Kate moved to San Francisco and entered medical school. She gained her M.D. in 1878, but had little success as a medical doctor. Meanwhile, she spent a great deal of time in the California Academy of Sciences "making myself useful, especially around the herbarium" (from autobiographical notes quoted by Setchell 1925). She began to collect plants in 1882 and in 1883 succeeded Albert Kellogg as curator of the CAS herbarium. The CAS was unusual among scientific organizations of the time in that it welcomed women members. Crosswhite and Crosswhite (1985) detail the extreme barriers in place during this time to women professionals (and to Kate specifically) and noted the difficulties that she faced as the highest placed female plant scientist of the time. As curator, Kate was very active in herbarium work and exploration. She took many botanical trips using the railroads, for which she enjoyed a general pass. Truly one of the leading authorities on California plants, she never completed a projected flora of the state, although she did provide a flora for Yosemite. She was extremely attentive to variation among plants, particularly among certain groups including the Cactaceae, *Lupinus*, *Eriogonum*, *Oenothera*, *Quercus* etc. She had broad species concepts and viewed plant variation as part of the evolutionary process. This put her at odds with other leading botanists, notably the western botanist E.L Greene, who was both a creationist and a "splitter".

Kate Brandegee has also been called a reformer (Crosswhite and Crosswhite 1985) and had little patience with careless or untidy botany. For example, she objected to the practice of reporting new species at oral meetings that would be eventually "published" in the Proceedings of the CAS up to four years later. She helped to establish and then edited the Bulletin of the CAS as a more direct venue for publication. In its first volume she published a 22-page article giving the results of her identifications of each of the species proposed in the old Proceedings. To promote even freer discussion and criticism, she and her new husband (TS) founded the journal Zoe in 1890. Kate is best known for her critical reviews that appeared here, most notably of the work of E.L. Greene and Nathaniel Britton. She started the first West Coast botanical club in 1891.

In 1894, Kate and TS moved to San Diego, turning over the curatorship of CAS to Kate's protégé, Alice Eastwood. From their "botanical paradise" that was their home in San Diego, Kate continued her explorations in California, while TS continued his explorations of Baja California and extended his explorations into mainland Mexico. During this period C.A. Purpus began sending TS specimens from California and surrounding states, but later took up sending him specimens from Mexico, including the states of Vera Cruz, Oaxaca, and Chiapas. Through an inheritance to TS, the Brandegees were largely of independent means, but in 1897, TS accepted employment mapping the Teton Forest Reserve in Wyoming. In

(Continued on page 3, Brandegees)

(Brandegees, Continued from page 2)

1906, the Brandegees donated their botanical collection (>75,000 specimens) and botanical library to the University of Californ ia and moved to Berkeley, where they lived the rest of their livcs. In these later years, Kate published less and completed less field work, but had a great effect on the maturation of her husband's professional career (Crosswhite and Crosswhite 1985). TS published extensive studies of the plants of Mexico, culminating in his best known work, the twelve volume Plantae mexicanae Purpusianae, published between 1909 and 1924.

Together, the Brandegees had an important and lasting influence on western North American botany. They were integral in the matriculation of the Pacific school from reliance on the expertise of Eastern botanists and they played an important role in the maturation of general botanical thinking in the west. Outside of botany, Kate was at the leading edge of what was a very significant assertion of rights for women professionals (Crosswhite and Crosswhite 1985). Their work reflects a life-long and honest respect for nature as reflected in the diversity of plants, an interest that went well beyond the desire to have their names associated with as many botanical entities as possible.

Table 1. Eponymy of New Mexico Plant Names (13)

Astragalus brandegeei Porter
Corydalis brandegeei S. Wats. (=***Corydalis caseana*** Gray subsp. ***brandegeei*** (S. Wats.) G. Ownbey)
Dicoria brandegeei Gray (=***Dicoria canescens*** A. Gray var. ***brandegeei*** (Gray) Cronquist)
Erigeron brandegeei A. Gray (=***Erigeron concinnus*** (Hook. & Arn.) Torr. & A. Gray var. ***concinnus***)
Eriogonum brandegeei Rydb.
Gilia brandegeei A. Gray (=***Polemonium brandegeei*** (A. Gray) Greene)
Hymenoxys brandegeei Porter ex A. Gray (=***Tetraneuris brandegeei*** (Porter ex A. Gray) Parker)
Penstemon brandegeei Porter ex Rydb. (=***Penstemon glaber*** Pursh var. ***brandegeei*** (Porter ex Rydb.) Freeman
Trifolium brandegeei S. Wats.
Zuckia brandegeei (A. Gray) Welsh & Stutz
Elodea brandegeeae St. John (= ***Elodea canadensis*** Michx.)
Galium brandegeei A. Gray (= ***Galium trifidum*** L. subsp. ***subbiflorum*** (Wieg.) Puff)
Ranunculus macauleyi A. Gray var. *brandegeei* L. Benson (=***Ranunculus macauleyi*** Gray)

Table 2. Authorship of New Mexico Plant Names (5)

Helianthus niveus (Benth.) Brandegee subsp. ***canescens*** (A. Gray) Heiser [Mexico]
Krynitzkia mexicana Brandegee (=***Cryptantha mexicana*** (Brandegee) I.M. Johnst.) [Coahuila, Mexico]
Thelypodium purpusii Brandegee (=***Thelypodiopsis purpusii*** (Brandegee) Rollins) [Mexico]
Hosackia plebeia Brandegee (=***Lotus plebeius*** (Brandegee) Barneby) [Baja, Mexico]
Scutellaria potosina Brandegee [Mexico]

Note: Complete lists of all taxa used for this report may be obtained from Chris Frazier.

Acknowledgements

We thank Gwen Davis of the Association for Biodiversity Information for calling this epithet problem to our attention.

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Slack, N.G. 2000b. Brandegee, Townshend Stith. American National Biography Online. http://www.anb.org/articles/13/13-00185. Oxford University Press.

What's In A Name?

I sometimes ask students about the meaning of the specific epithet of *Eragrostis cilianensis*. Almost invariably, they respond that it signifies something about hairs, relying on their knowledge of the term ciliate. This allows me to take a little jaunt into the interesting world of botanical Latin and the use of adjectival suffixes to indicate geographic origin. Whenever we see the ending *–ensis*, we can be sure that the word is referring to a place, in this case, the Ciliani Estate in Italy, from whence came a specimen of stinkgrass. Other *–ensis* names from the New Mexico flora are *Cheilanthes alabamensis, Juniperus coahulensis, Osmorhiza chilensis, Asclepias sanjuanensis, Helianthus arizonensis, Astragalus missouriensis, Cryptantha nevadensis, Lesquerella navajoensis, Echinocactus texensis, Escobaria organensis, Lonicera utahensis,* and *Penstemon alamosensis*, to name just a few. There are no "*new-mexicensis*" names. Rather, our fair state is commemorated by "*neomexicana*" or "*novomexicana*" (with appropriate endings to reflect gender), such as *Stipa neomexicana, Cirsium neomexicanum, Erigeron neomexicanus, Delphinium novomexicanum,* and *Heuchera novomexicana.* — ka

A Key To *Calochortus* In New Mexico

David Bleakly
3813 Monroe, NE, Albuquerque, NM 87110

This key is offercd as an alternative to existing keys; it is not revisionary. An exhaustive study was not made of the regional herbaria to obtain the most complete range data. Therefore, sego lilies may be found in more counties than those indicated below. When collecting, press the flowers so the inside of at least one petal is visible, preferably with the flower completely open. Note the color and gland characteristics of frcsh flowers before pressing.

Terminology: **Bulbiferous** = producing solitary bulblets in axils of lowest leaf or leaves, usually at or below ground level; the stems arise from deep-seated bulbs. **Glands** are usually depressed and encircled entirely or partially by a ± fringed membrane, and are densely short-hairy inside. **Petal hairs** are longer than the gland hairs located on the inner surface of the petals, and arelocated outside but near the gland. **Hair tips** of either type may be entire or sometimes dilated or branched, depending on the species.

1 *Stems* decumbent to weakly erect, often twining among other plants or straggling along ground, branched; *plants* rarely bulbiferous; *petals* white with lilac tinge to purplish, with transverse yellow band at the gland & usually with purple spot on claw below gland; *glands* not (or only slightly) depressed, transversely lunate to orbicular; *membrane* around gland none; *petal hairs* few, short, thick or petals glabrous; dry stony slopes & rocky mesas & flats; 1600–6600 ft; sw&nwNM (HI, SJ), swCO, nAZ, s&eUT, sNV, seCA; Apr–Jun..... ***Calochortus flexuosus*** S. Wats.

1 *Stems* strict, erect; *plants* usually bulbiferous; *petals* white, purplish, yellow, sometimes or often with narrow curved purple band above gland & a purple spot on claw below gland; *petal hairs* usually elongate, simple or branched; *glands* transversely elongate or circular, depressed; *membrane* partly or completely surrounding gland

2 *Glands* narrowly or broadly elongate transversely, bottom of gland not curved downward, usually arched upward or at least perpendicular to axis of petal (sometimes curved downward & gland orbicular in *C. ambiguus*); *petal hairs* yellow, tips enlarged or branched & ± glandular, bases of petal hairs sometimes purplish; *petals* sometimes marked with many short, narrow purple striae that are often associated with the purple bases of petal hairs, particularly in *C. gunnisonii*; *anther tips* acute or obtuse

3 *Glands* narrow, oblong, elongate, usually arched; *petal hairs* elongate, tips branched; *petals* white to purple or yellow; *sepals* often with purple band & spot (but no gland); *anther tips* acute to apiculate; dry to moist slopes, primarily in Rocky Mountains; 7200–9200 (10,500) ft; Jun–Aug..... ***Calochortus gunnisonii*** S. Wats.

4 Petals white or purple; NM (BE [Sandia Mts], CA, CO, LA, MC [Chuska Mts], RA, SA [Jemez Mts], SJ [Chuska Mts], TA, TO [Manzano Mts], UN [Sierra Grande]), seAZ, eUT, CO, WY, MT, SD (Black Hills)..... var. ***gunnisonii***

4 Petals yellow; known only from nNM (MO, SM)..... var. ***perpulcher*** Cockerell

3 *Glands* transversely lunate to orbicular; *petal hairs* yellowish, elongate, tips expanded to slightly lobed; *petals* pinkish to bluish-gray, rarely with narrow longitudinal gray stripe on petals & sepals; *anther tips* usually obtuse (rarely acute); may be confused with *C. nuttallii*; dry slopes & hills; 6600–8200 ft; swNM (GR, HI, MC), AZ, swUT; May–Jul ***Calochortus ambiguus*** (M.E. Jones) Ownbey

2 *Glands* circular; *petal hairs* simple; *anther tips* obtuse

5 *Glands* orbicular to transversely lunate; *petal hairs* yellowish, elongate, tips expanded to slightly lobed; *petals* pinkish to bluish-gray, rarely with narrow longitudinal gray stripe on petals & sepals; *anther tips* usually obtuse (rarely acute); may be confused with *C. nuttallii*; dry slopes & hills; 6600–8200 ft; swNM (GR, HI, MC), AZ, swUT; May–Jul ***Calochortus ambiguus*** (M.E. Jones) Ownbey

5 *Glands* circular; *petal hairs* few, elongate, yellowish, tips simple (rarely slightly dilated); *petals* & *sepals* with reddish-brown or purple band or spot above gland

6 Petals lemon yellow; dry sandy or clayey locations; 3900–6600 ft; nwNM (CI, MC, SJ), ec&nAZ, s&eUT, May–Jun..... ***Calochortus aureus*** S. Wats.

6 Petals white, tinged with lilac (rarely magenta), yellow at base of claw; state flower of UT; bulbs edible; most widespread species of genus; may be confused with *C. ambiguus*; dry slopes & flats; 2400–8200 ft; northern Great Plains to Wyoming Basin & south, nwNM (GR, RA, SA, SJ, TA), nAZ, wCO, UT, e&sNV, WY, MT, seID, ND; Jun–Jul..... ***Calochortus nuttallii*** Torr. & Gray var. ***nuttallii***

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Botany is the natural science that transmits the knowledge of plants.
— Linnaeus

On Our Alpine Potentillas

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There are problems with classifying, identifying, and finding the alpine cinquefoils reported for New Mexico. This note does not solve the problems but is meant to promote observations and reflections that will do so.

To put all the names on the table, I begin with a key that uses species-names for taxa reported from the state's tundra, though some of these taxa are better treated at lower levels. The key borrows from Weber and Wittman (1996) and from Holmgren (1997). These sources and others disagree in characterizing several species, especially *Potentilla rubricaulis*.

1 Shrub; style lateral ..... ***Potentilla fruticosa*** (*Pentaphylloides floribunda*)
1 Herb, style basal or near-terminal
2 Basal leaves pinnate, most leaves with 7 to13 leaflets
3 Style basal; plant often stieky ..... ***Potentilla glandulosa*** (*Drymocaulis glandulosa*)
3 Style near-terminal; plant not stieky
4 Style to 1.1 mm long, conical from base; leaflets revolute ..... ***Potentilla pensylvanica***
4 Style 1.2 mm or longer, cylindric; leaflets not revolute
5 Basal leaves with 7-15 leaflets evenly reduced in size downward ..... ***Potentilla hippiana***
5 Basal leaves with 5 to 7 leaflets, lowest leaflet-pair(s) much reduced and separated ..... ***Potentilla subjuga***
2 Basal leaves digitate or subdigitate, most leaves with 3 to 7 leaflets
6 Style to 1.1 mm long, at the base conical or papillose or glandular-thickened
7 Leaflets 5 (-7), the petioles pilose, some also obscurely tomentose ..... ***Potentilla rubricaulis***
7 Leaflets 3, the petioles various
8 Petioles densely pilose (with or without tomentum); flowers (1)-2-3 per stem ..... ***Potentilla uniflora***
8 Petioles densely tomentose (with or without some straight hairs); usually more than 3 flowers per stem .. ***Potentilla nivea***
6 Style 1.2 mm or longer, cylindric to claviform
9 Leaflets glabrous to sericeous below, not tomentose
10 Leaflets 5 with 3 apical teeth; leaf surfaces usually glabrate ..... ***Potentilla sierrae-blancae***
10 Leaflets 5-7 with 3-7 teeth above the middle; leaf surfaces usually sericeous (to glabrate) ..... ***Potentilla diversifolia***
9 Leaflets white-tomentose below
11 Leaflets incised ½ to 2/3 toward midrib
12 Leaves digitate or nearly so; usually flowering in June, stems spreading in fruit ..... ***Potentilla divisa***
12 Leaves loosely subdigitate, the lowest leaflets reduced and separated, flowering in July-August; stems erect ..... ***Potentilla subjuga***
11 Leaflets incised less than ½ way to midrib
13 Plants (in tundra) 2-8 cm tall; 1-6 flowers per stem; anthers 0.6-0.9 mm long; usually flowering in June ..... ***Potentilla concinna***
13 Plants taller than 15 cm; stems many-flowered; anthers 0.7-1.1 (-1.4) mm long; flowering July-August ..... ***Potentilla pulcherrima***

Potentilla concinna Richardson var. ***concinna*** is widespread in northern New Mexico. Riffle (1973) has it from 8 collecting areas in the Zuñi Mountains. Garcia (1970) has it from Mt. Taylor and Sugarite Canyon, and I too have it from Sugarite, among other low-elevation areas. Johnston (1980) has 3 map-dots in Colfax and Taos counties. In alpine tundra, Baker (1983) found it in 7 of 10 alpine vegetation types on Mt. Wheeler and I have collections from the Costilla Massif (Taos County near the Colorado border) to 12,880 feet elevation and from Gold Hill (Taos County) to 12,700. I emphasize these records because Allred's (1999) dropping var. *concinna* from the list of New Mexican plants was the occasion for this review. *P. concinna* as keyed above includes plants of very different appearances, even aside from the variant called *P. divisa* above. Alpine plants are compact and usually 2-3 cm tall; lower-elevation plants are sprawling and 6-10 cm tall. All have leaflets densely white-tomentose below but their upper surfaces vary from shiny green with a few strigose hairs to thinly white-tomentose. In my experience the inflorescences are always spreading or ascending and become more nearly horizontal as the fruits mature.

Potentilla diversifolia Lehmann is reported (correctly?) as low as 8,000 feet elevation in the San Francisco, Jemez, and Sandia Mountains, but the species is alpine or near-alpine in the Sacramento and Sangre de Cristo Mountains, and on some mountains is the most common alpine potentilla.

Potentilla divisa (Rydb.) Rydb. is also known as *P. concinna* var. *divisa* Rydb. and (a name applied mistakenly) *P. quinquefolia* Rydb. It has not previously been reported in New Mexico, but is common on the Costilla Massif (RSP 79-32). However, Johnston (1980) states that this form of *P. concinna* with deeply cut leaflets occurs throughout the range of *P. concinna* var. *concinna* and is not worthy of taxonomic separation from that variety.

(Continued on page 6, Potentilla)

(Potentilla, Continued from page 5)

Potentilla fruticosa L. [*Dasiphora fruticosa* (L.) Rydb., *Pentaphylloides floribunda* (Pursh) Löve] occurs mainly at timberline and in the subalpine but is also alpine. Baker (1983) designated stands dominated by it as one of the ten alpine vegetation types of Mt. Wheeler.

Potentilla glandulosa Lindl. [*Drymocaulis glandulosa* (Lindl.) Rydb.] occurs mostly at lower elevations (Martin and Hutchins have it at 7000-9000 feet) but was reported (as *P. filipes* Rydb.) from alpine tundra by Wooton and Standley (1915). I have not seen it above timberline. Harrington (1954) and Weber and Wittman (1996) have *P. glandulosa* in northern Colorado and northward; perhaps they would assign the New Mexican plant to *P. fissa* Nutt. [*Drymocaulis fissa* (Nutt.) Rydb.].

Potentilla gracilis Dougl. *ex* Hook. is reported from the alpine of Mt. Wheeler by Baker (1983). Because *P. gracilis sensu stricto* is mostly found in the lower subalpine or lower vegetation, and because Baker does not otherwise mention *P. gracilis* var. *pulcherrima*, I assume that he refers to the taxon here treated as *P. pulcherrima* so I have omitted *P. gracilis sensu stricto* from the key.

Potentilla hippiana Lehmann occurs mainly at lower elevations but is also above timberline. It is said to form a confusing array of hybrids with *P. pulcherrima*, *P. diversifolia*, and *P. concinna* (Garcia 1970, Johnston 1980, Weber and Wittmann 1996, Holmgren 1997).

Potentilla nivea L. is known on alpine ridges in Colorado and Utah. Welsh et al. (1993) state that the species occurs in New Mexico. I've seen no other such record. Taxonomy of *P. nivea* and its close relatives is confused and controversial; see Hansen et al. (2000).

Potentilla pensylvanica L. is widespread in New Mexico but its alpine occurrences may be limited to Mt. Wheeler and Sierra Blanca. Welsh et al. (1993) and Weber and Wittman (1996) record an alpine, subdigitate form, var. *paucijuga* (Rydb.) Welsh and Johnston (but see *P. rubricaulis* below). I know no record of this variety from New Mexico, but palmately 5-7 foliolate plants should be checked for the short styles of var. *paucijuga* or *P. rubricaulis*.

Potentilla pulcherrima Lehmann is widespread in New Mexico, mostly at lower elevations but also in tundra. It is variable and sometimes is difficult to distinguish from *P. concinna*, and with *P. hippiana* it produces a confusing array of hybrids. Holmgren (1997) and some other authors treat *P. pulcherrima* as *P. gracilis* var. *pulcherrima* (Lehm.) Fernald.

Potentilla rubricaulis Lehmann is to my knowledge unknown in New Mexico except for Baker's (1983) report of it in the tundra of Mt. Wheeler. The name has been variously applied (Welsh et al. 1993). Weber and Wittman (1996) treat *P. hookeriana* Lehm. as a separate species (with leaflets 3) but Welsh et al. include it in *P. rubricaulis* (with leaflets 5-7). Holmgren (1997) includes *P. pensylvanica* var. *paucijuga* in his version of *P. rubricaulis*. That "*Potentilla rubricaulis*" represents different entities is indicated by Holmgren's measuring anthers 0.3-0.5 mm long (smaller than in any other potentilla) and Harrington (1954) 0.5-0.8 mm.

Potentilla sierrae-blancae Woot. & Rydb. is known only from Sierra Blanca, where it is on rock ridges and alpine fellfields. Keys that claim the plant to be "completely glabrous" (Wooton and Standley 1915; Martin and Hutchins 1980) are wrong; stems, bracteoles, sepals, and hypanthiums are villous, leaflets are coarsely ciliate and their lower surfaces are sparsely villous to glabrate. The anthers seem never to have been described; they are 0.5-0.7 mm long.

Potentilla subjuga Rydb. is known from northern Taos County (Johnston 1980), from Wheeler Peak (McKay 1970), from the Latir Peaks (Spellenberg et al. 1986), and from the Costilla Massif (RSP 79-32, 82-375) and Gold Hill (RSP 00-276). It has also been known as *P. concinna* Richardson var. *rubripes* (Rydb.) C. L. Hitchcock.

Potentilla uniflora Ledeb..(*P. ledebouriana* Porsild) is to my knowledge recorded for New Mexico only by McKay (1970), although he did not regard his report as a state record so must have known an earlier report.

Of the above 14 entities, two (*P. gracilis sensu stricto* and *P. glandulosa*) are not reliably reported from New Mexican tundra, one (*P. divisa*) reduces to *P. concinna* var. *concinna*, and three (*P. nivea, P. rubricaulis,* and *P. uniflora*) are known from single reports about which there could be questions of identification. That leaves eight alpine species, plus hybrids of *P. hippiana*. Characteristics of these species in New Mexico are inadequately known and no existing key will reliably identify them.

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New Plant Distribution Records

New records for New Mexico are documented by complete collection information and disposition of a specimen (herbarium).

— Steve L. O'Kane [Department of Biology, University of Northern Iowa, Cedar Falls, IA 50614] and Ken Heil [San Juan College, Farmington, NM 87402]

Lesquerella pruinosa Greene (Brassicaceae): Rio Arriba Co: Rolling low hills of sage and grassland WSW of Eagle Point, 1.2 miles west of hwy 84 on County Road 349, Mancos Shale. 36°56'15"N 106°48'58"W. Elev. 2312m. 6 June 2000. O'Kane & Heil, 4822B (ISTC, SJNM).

— Richard Worthington [P.O. Box 13331, El Paso, TX 79913]

Agastache pallidiflora (Heller) Rydberg subsp. ***pallidiflora*** var. ***havardii*** (A. Gray) R. Sanders (Lamiaccae): Eddy Co: Guadalupe Mts, upper part of south fork of Big Canyon, 6900 ft, 13 Aug 2000, Worthington 30198 (NMCR, UTEP).

— Ken Heil [San Juan College, Farmington, NM 87402] and Kelly W. Allred [MSC Box 3-I, New Mexico State University, Las Cruces, NM 88003]

Salsola paulsenii Litv. (Chenopodiaceae): McKinley Co: Navajo Nation, ca. 5 miles north of Tohatchi on US 666, 6180 ft, 23 Aug 2000, K. Heil 15367 (NMCR, SJNM); San Juan Co: B-Square Ranch, Gallegos Wash near the junction with San Juan River, 5200 ft, K. Heil & S.L. O'Kane 14694 (NMCR, SJNM).

— Tim Reeves [San Juan College, Farmington, NM 87402]

Glaux maritima L. (Primulaceae): San Juan Co: San Juan River, BLM Valdez Tract, *Juncus* marsh west of picnic area, with cattails, salt cedar, Russian olive, and cottonwood, one local patch, T29N, R10W, S19 & 20, 7 July 1999, Tim Reeves 9887 (SJNM).

Botanical Literature of Interest

TAXONOMY AND FLORISTICS:

MISCELLANEOUS:

Stuckey, R.L. & W.R. Burk (eds.). 2000. **History of North American Botany.** Sida, Botanical Miscellany #19 (ISSN 0883-1475). 376 pp.

RARE, THREATENED, AND ENDANGERED PLANTS:

[See New Mexico Rare Plants, presented by the NM Rare Plant Technical Council: http://nmrareplants.unm.edu]

WEB SITES OF INTEREST:

PhyloCode: a formal set of rules governing phylogenetic nomenclature: http://www.ohiou.edu/phylocode/

NatureServe: An Online Encyclopedia of Life. Gives "authoritative conservation information on more than 50,000 plants, animals, and ecological communities of the United States and Canada." http://www.natureserve.org/index.htm

Astragalus website: http://loco.ucdavis.edu/astragalus/astragalus_home.htm

Plant Trivia Timeline from Huntington Botanical Gardens: http://www.huntington.org/BotanicalDiv/Timeline.html

CALENDAR —

- Botany 2001: 12-16 August 2001, Albuquerque, NM. Details at www.botany2001.org
- Andre Michaux International Symposium: 15-19 May 2002, Gaston County, NC. Details at www.michaux.org

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Kelly Allred
Range Plant Specialist

JUNIPER MISTLETOES: 1, 2, and *Phsp.*?

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In New Mexico three species of *Phoradendron* parasitize junipers. All are dioecious. They are spread mainly by the thrushes (including bluebirds), waxwings, and phainopeplas that eat their berries. Unlike the more destructive dwarf mistletoes (*Arceuthobium*) on other conifers, phoradendrons manufacture much of their own food, taking only water and minerals from their hosts.

Most abundant is the leafless *Ph. juniperinum*, found throughout the state except along the eastern border. Winter-flowering *Ph. capitellatum*, with pubescent leaves 1-2 x 8-14 mm., is in Arizona and southwestern New Mexico, west of the Rio Grande. A summer-flowering *Phoradendron* sp., with glabrous leaves that measure 1.5-3 x 6-20 mm., is in southwestern Texas and southeastern New Mexico well east of the Rio.

Why "sp."? It does have names: *Ph. bolleanum* subsp. *hawksworthii* (which first appeared in Correll and Johnson, 1970, Manual of the Va scular Plants of Texas) and *Ph. hawksworthii* (which has appeared for 20 years in Forest Service publications and the draft Chihuahuan Desert Flora). Their authors are cited respectively as "Wiens" and "(Wiens) Wiens." But Del Wiens (University of Utah) says that he's never published the names, for reasons too long to recite from his present loeation (he's currently docked in Australia wh ile taking a sailboat around the world). So it's *Phoradendron* sp. or *Ph. hawksworthii* ined. for those of us working on Guadalupe Mountains plants.

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